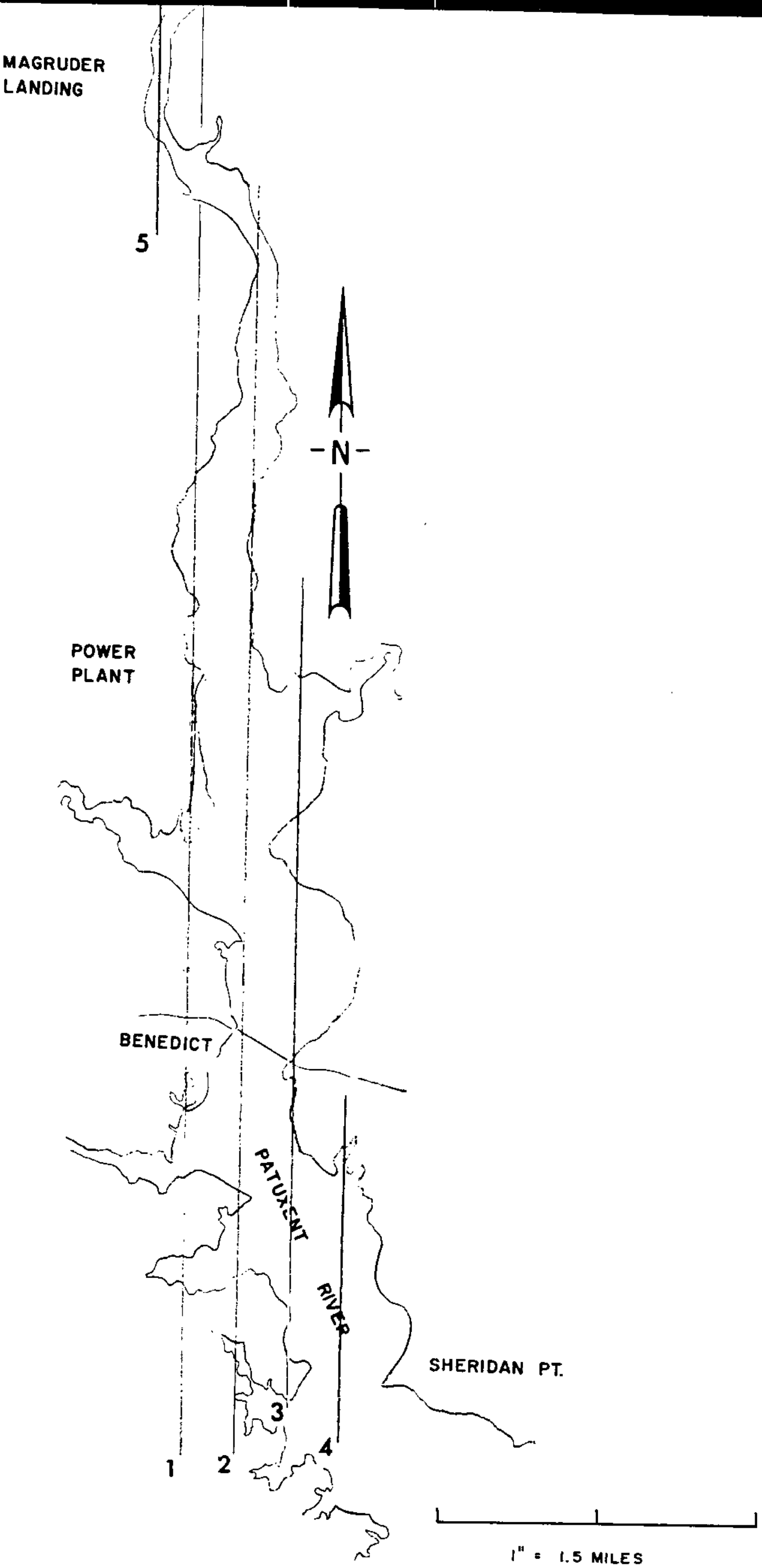
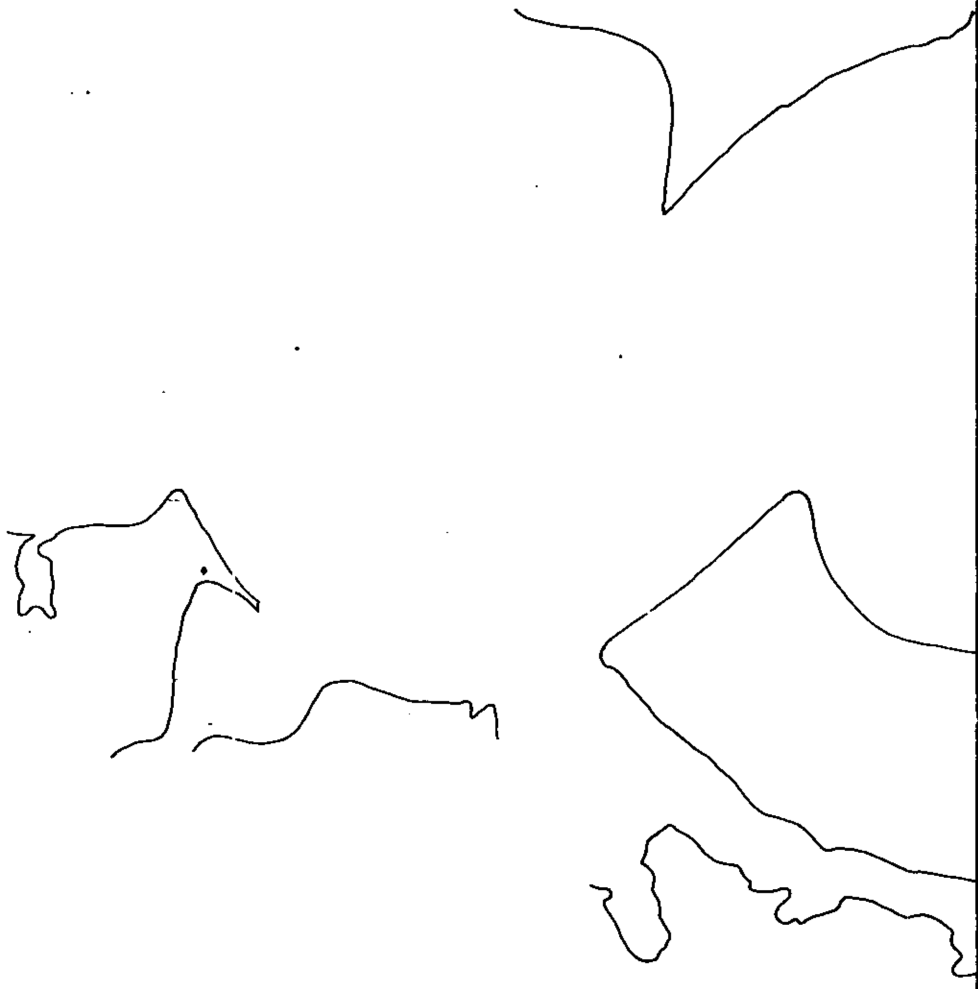
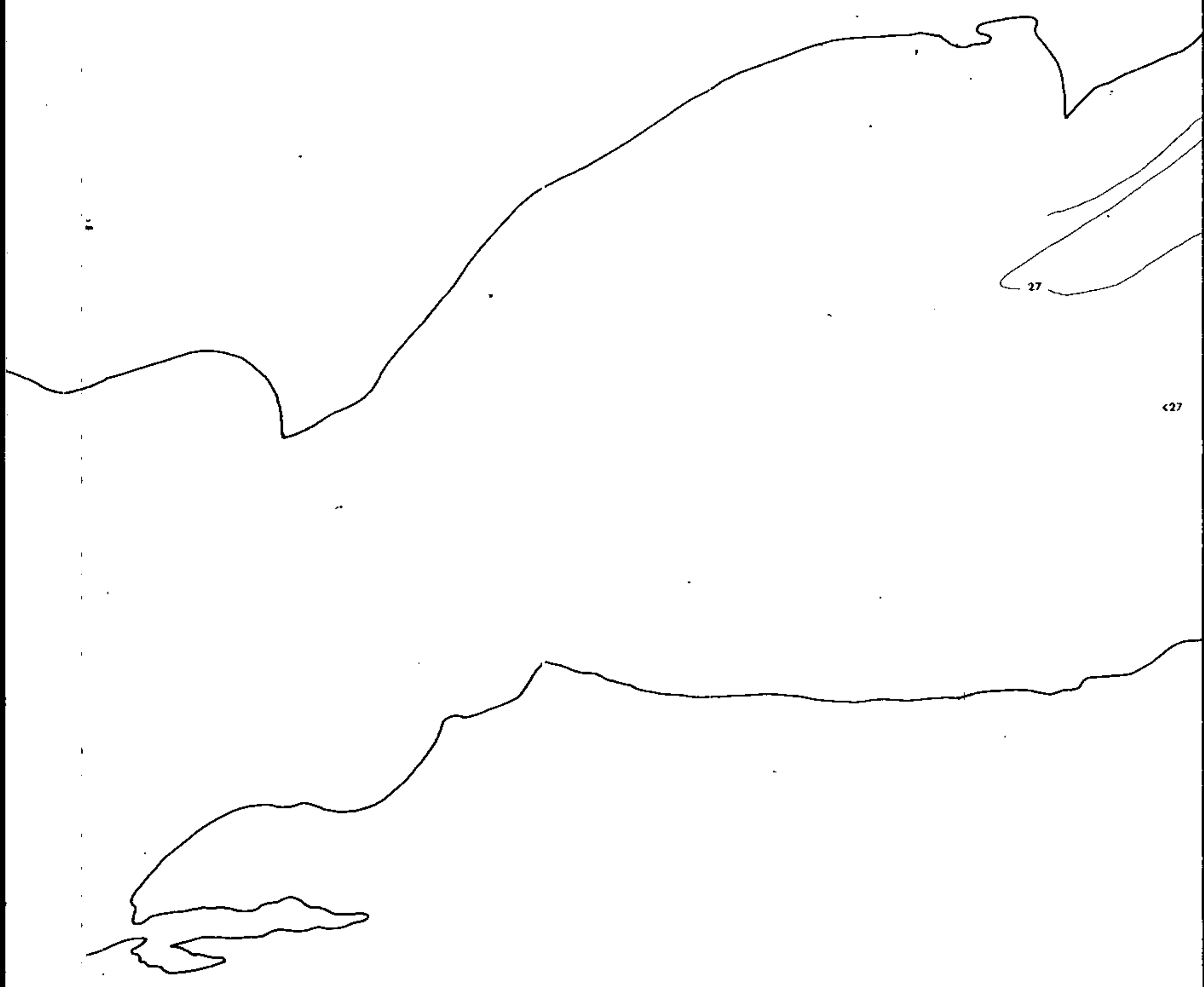


Figure 17. Flight Path Map, Chalk Point

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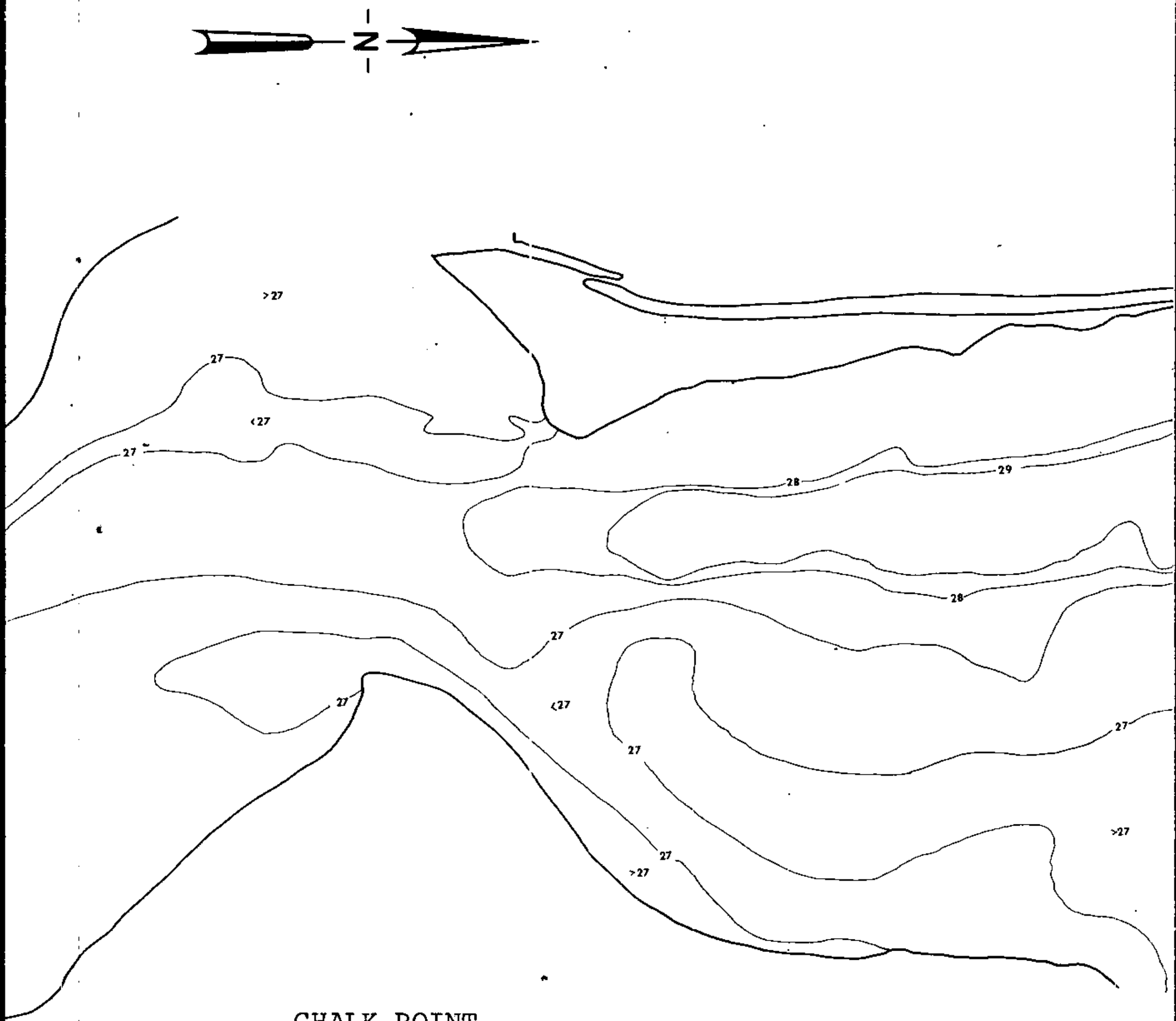
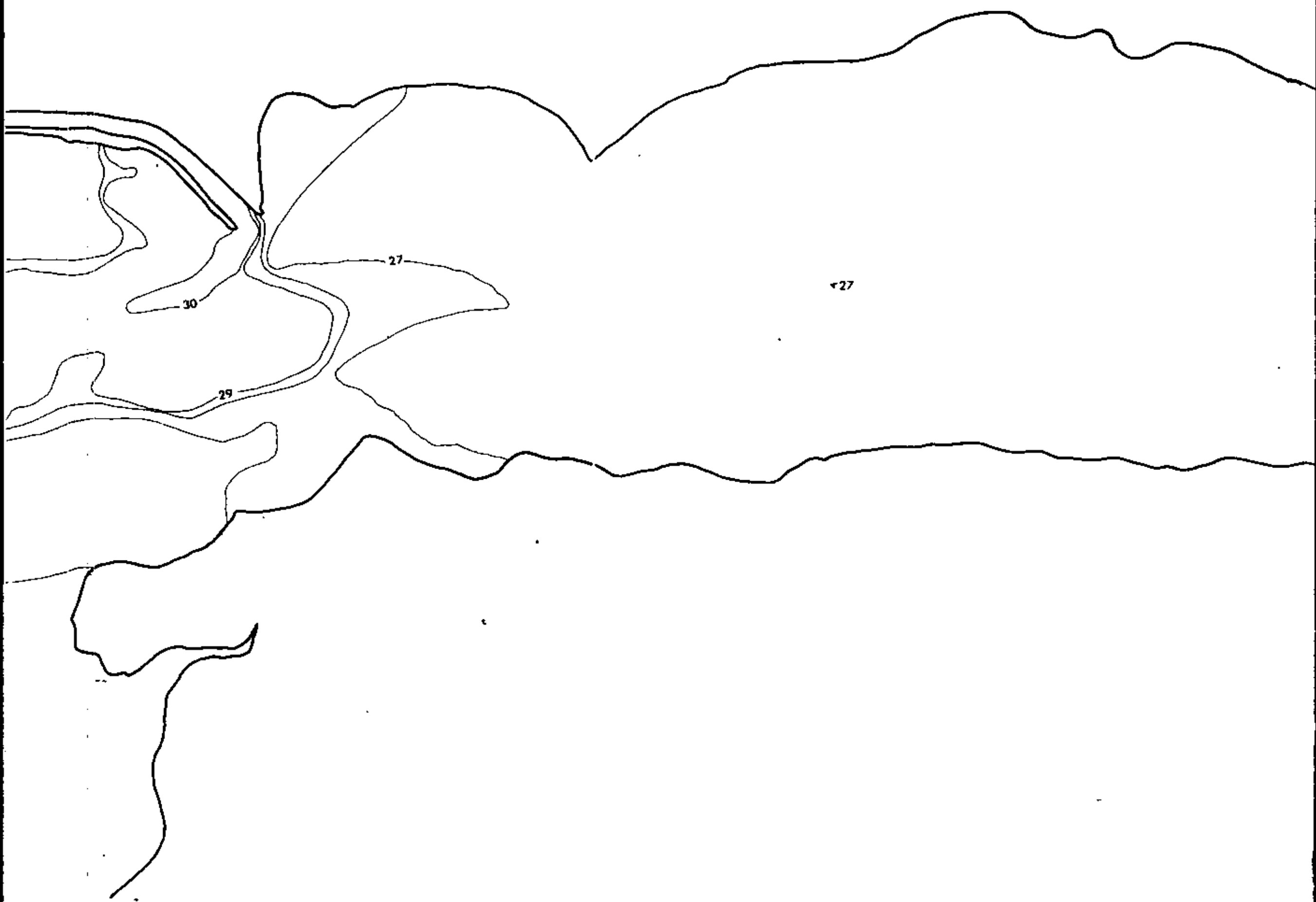


CHALK POINT

EBB CURRENT
ISOTHERMAL CONTOUR MAP
DATE: JULY 18, 1978
TIME: 1810-1858

1500' 0' 1500' 3000'

APPROX. SCALE 1"=1500'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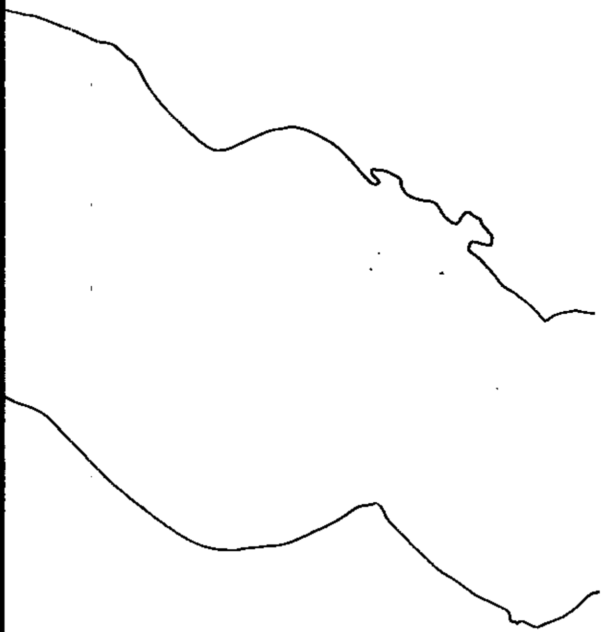

FIGURE 18

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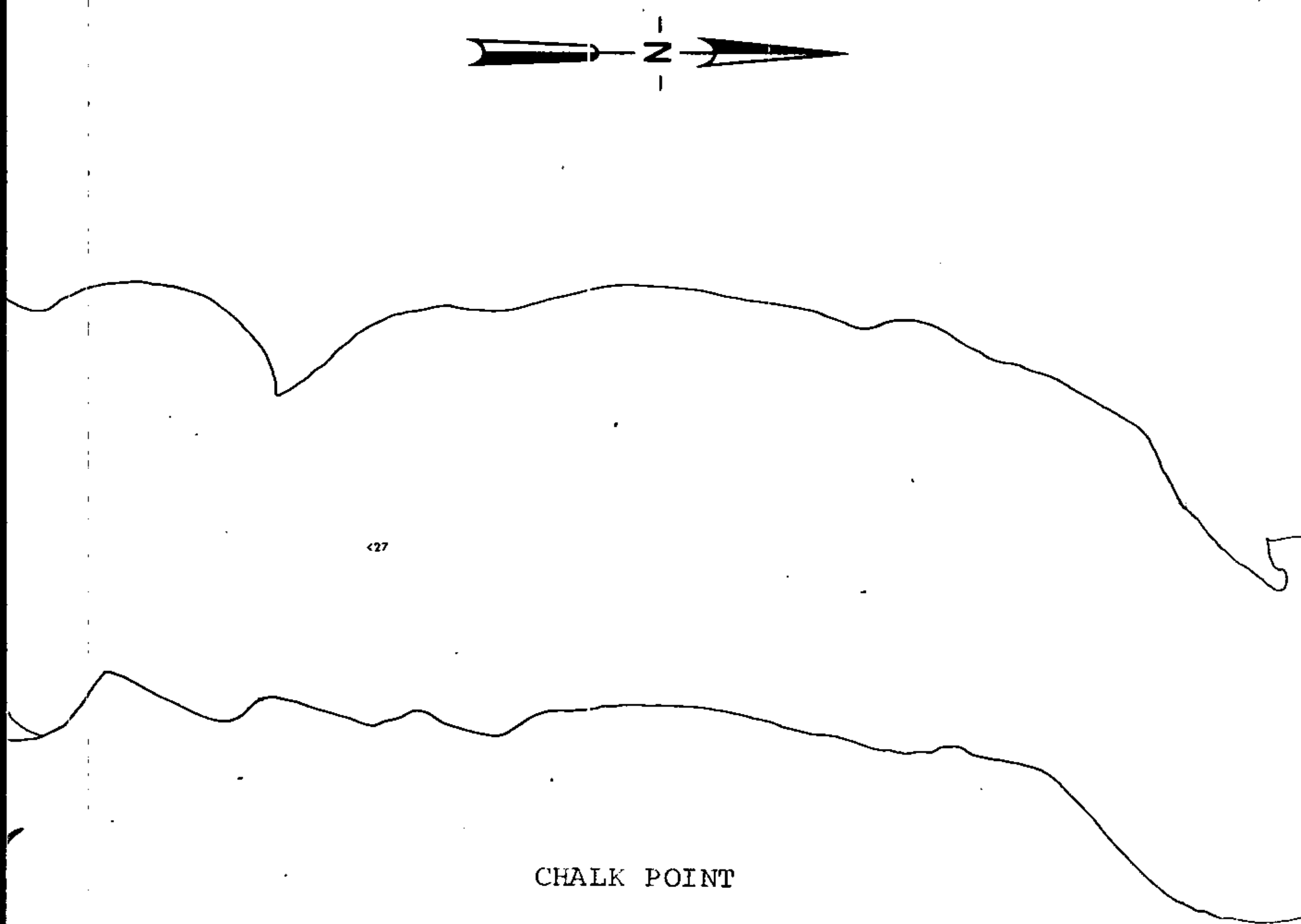
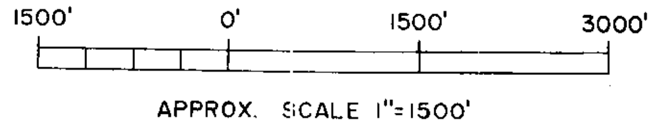


CHALK POINT

SLACK BEFORE FLOOD
ISOTHERMAL CONTOUR MAP
DATE: JULY 18, 1978
TIME: 2104-2159



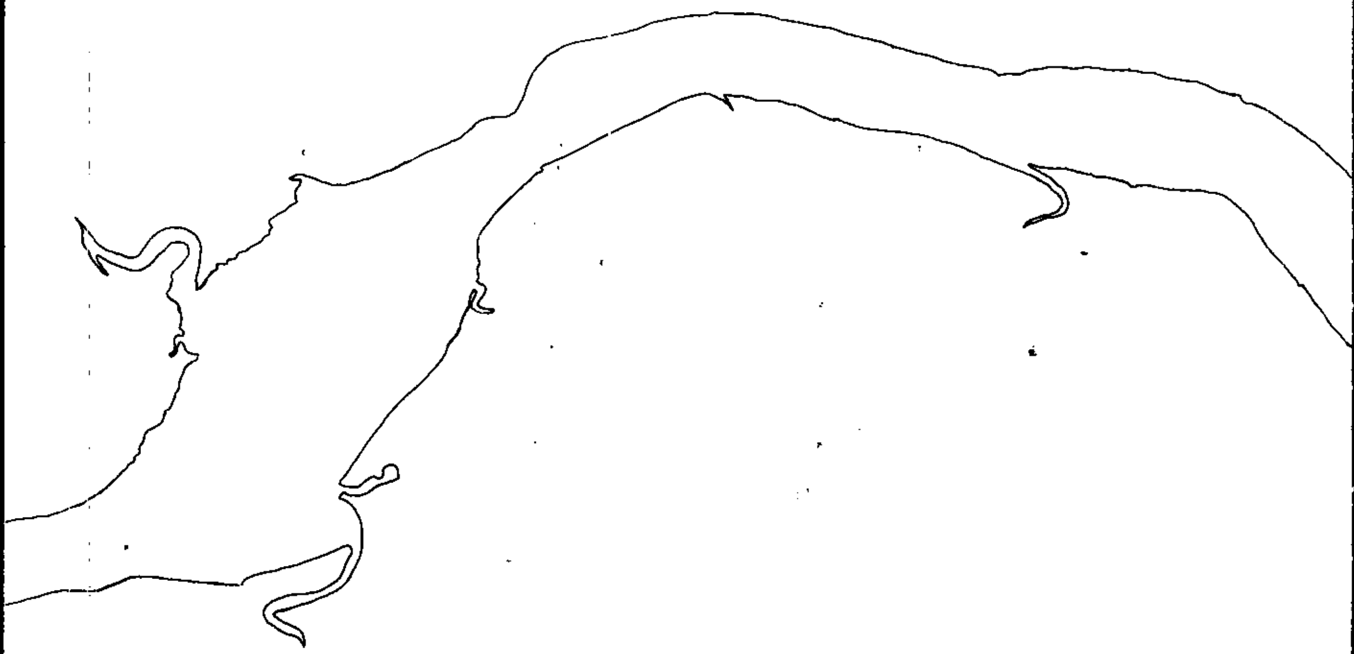
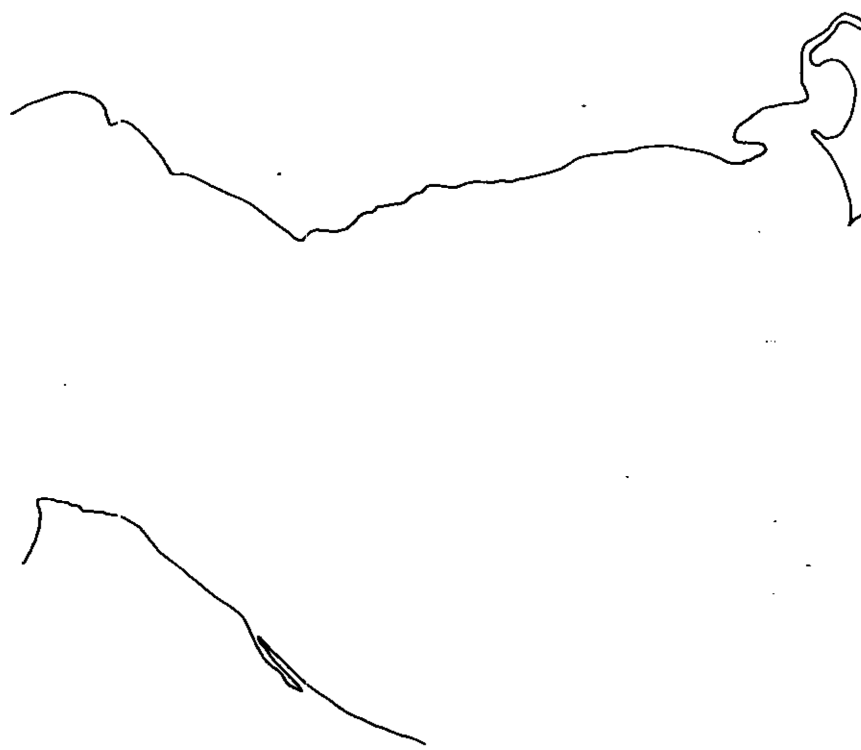
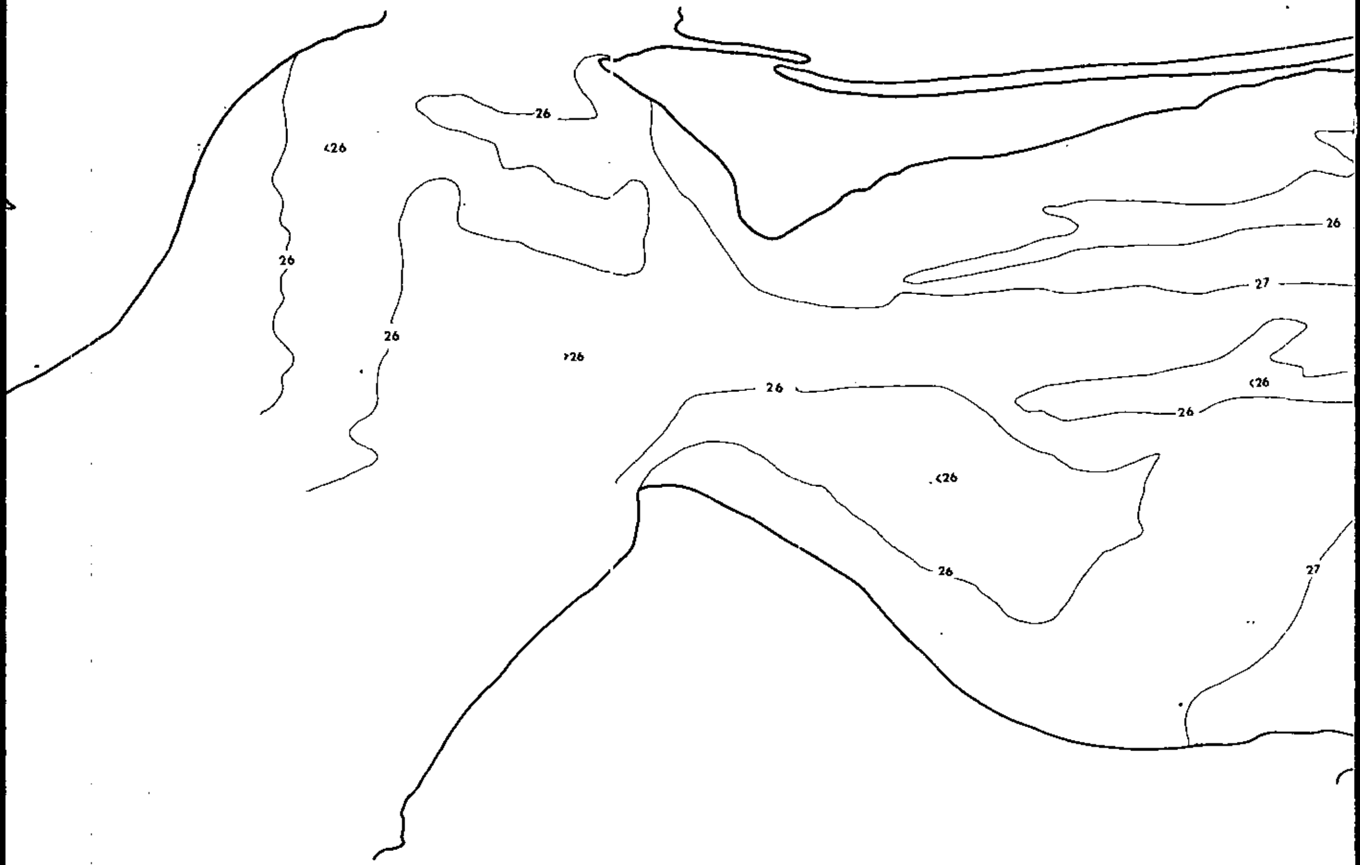


FIGURE 19

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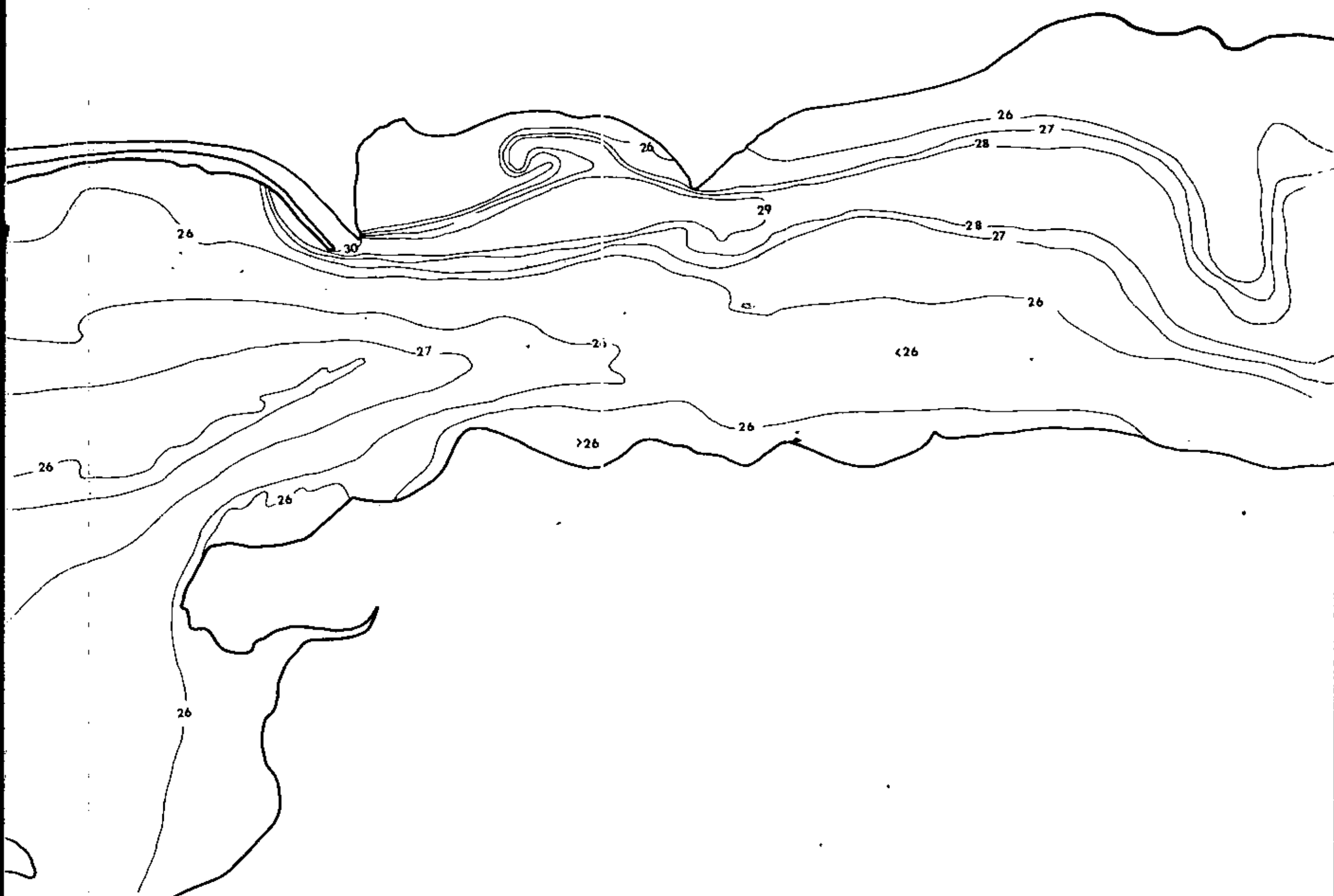
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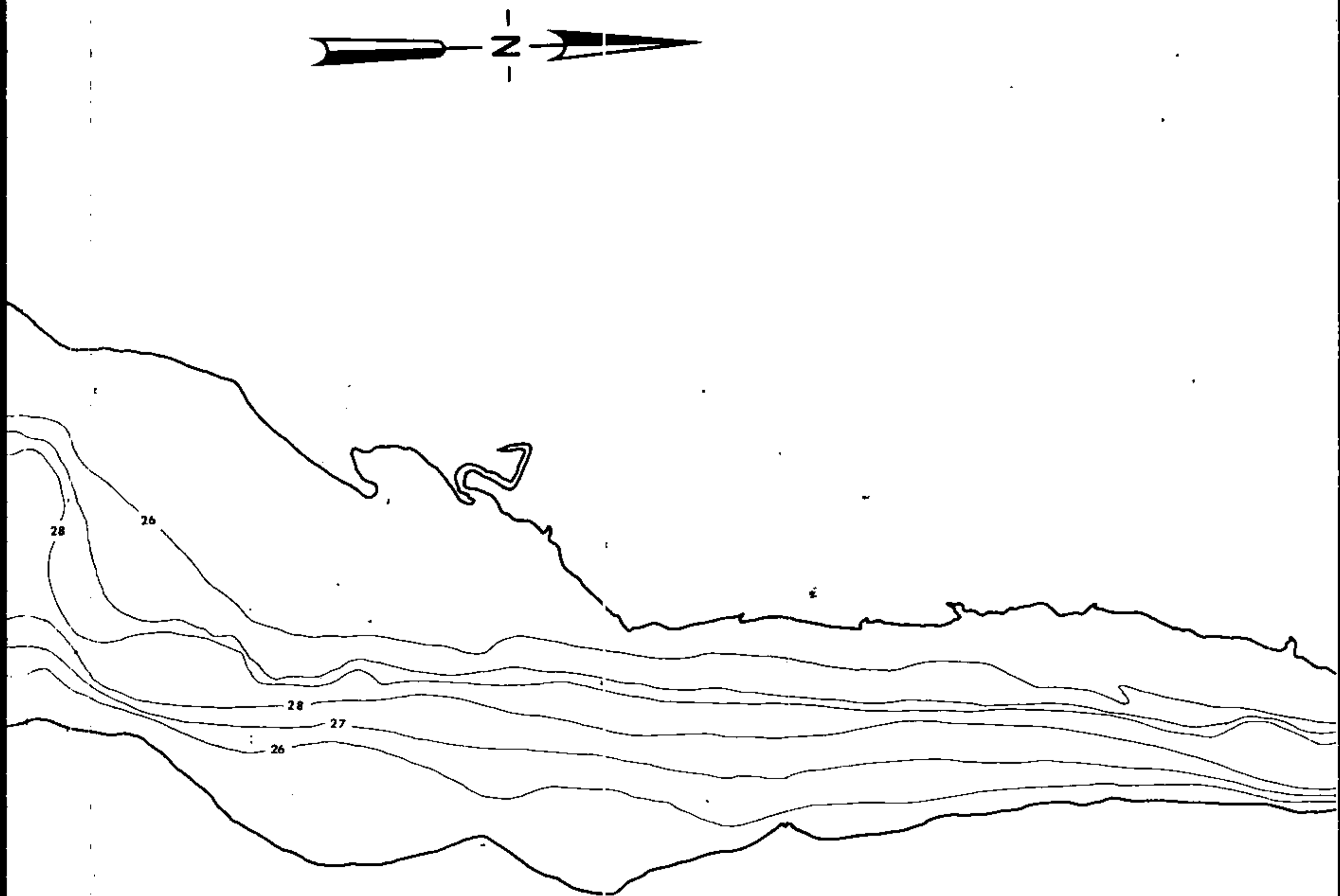
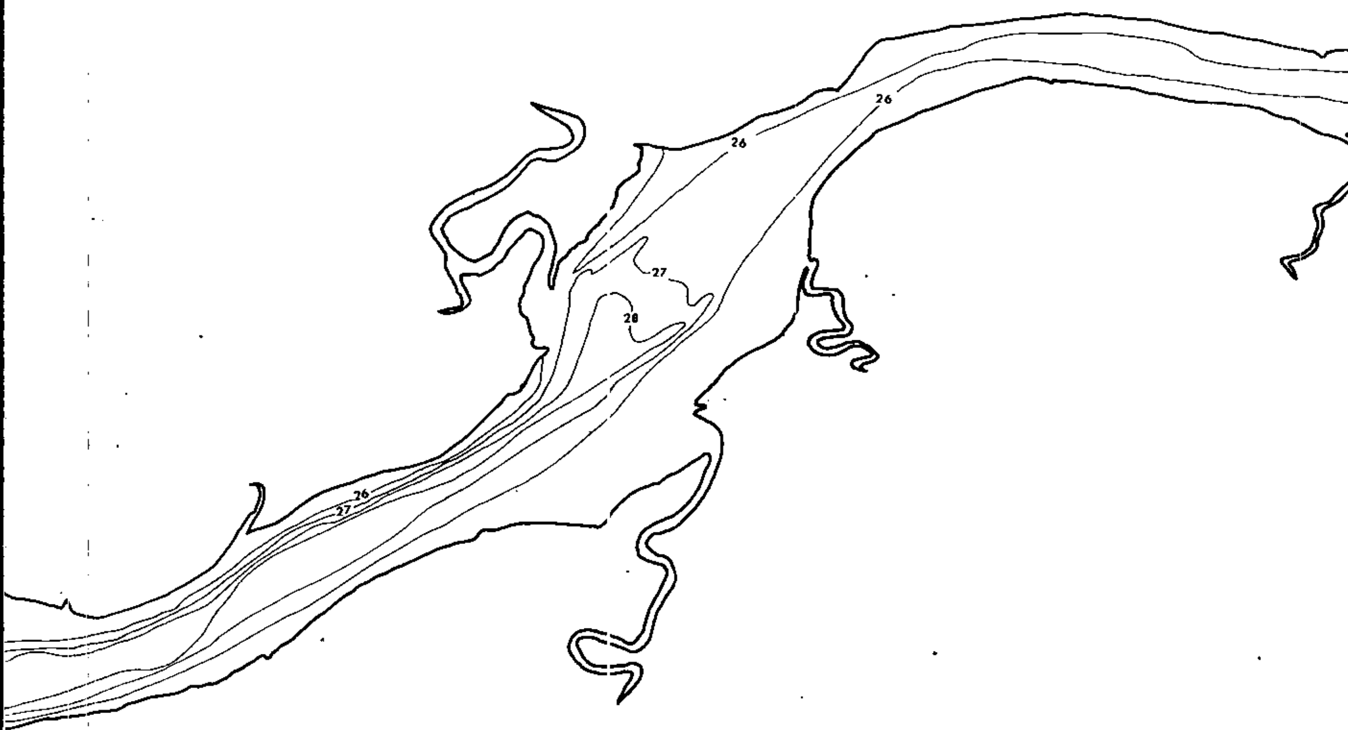


CHALK POINT

FLOOD CURRENT
ISOTHERMAL CONTOUR MAP
DATE: JULY 18 , 1978
TIME: 1150-1225

1500' 0' 1500' 3000'

APPROX. SCALE 1"=1500'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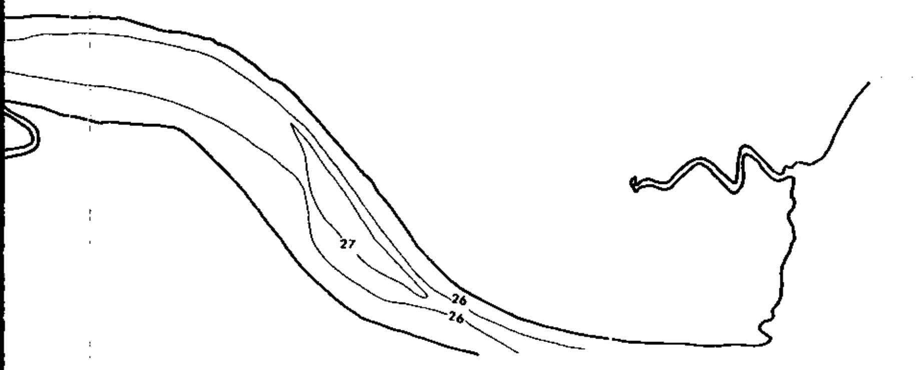
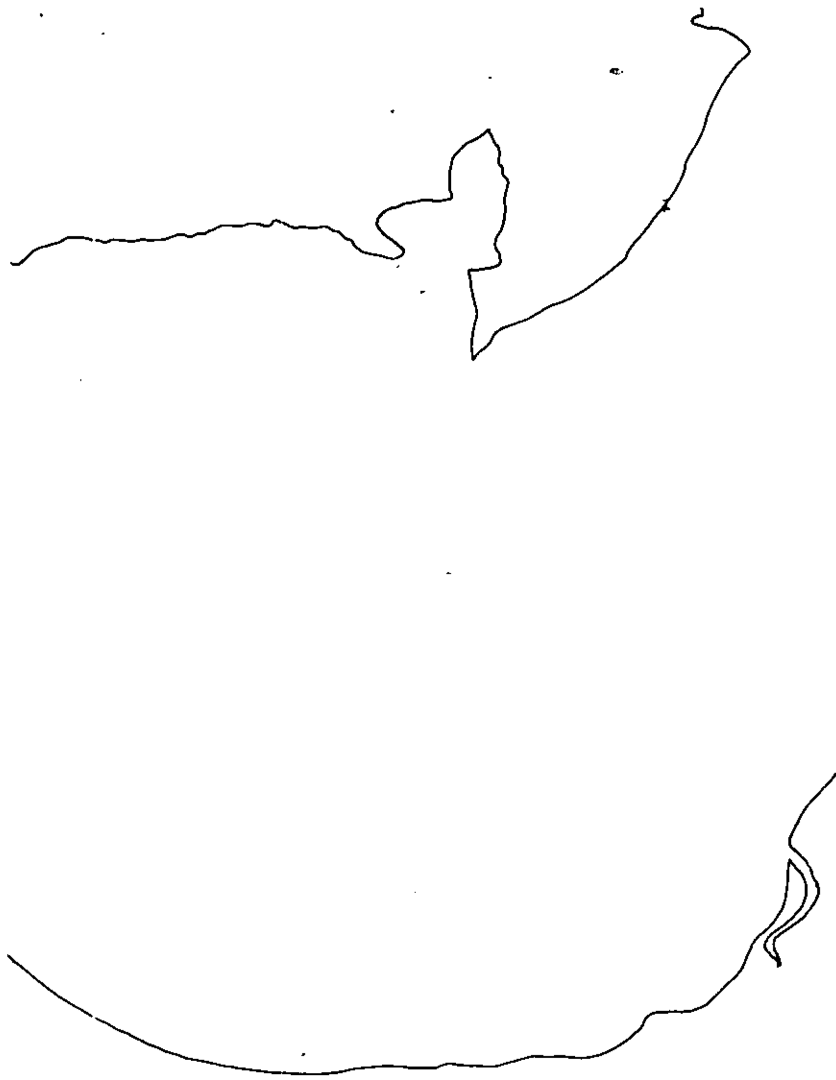
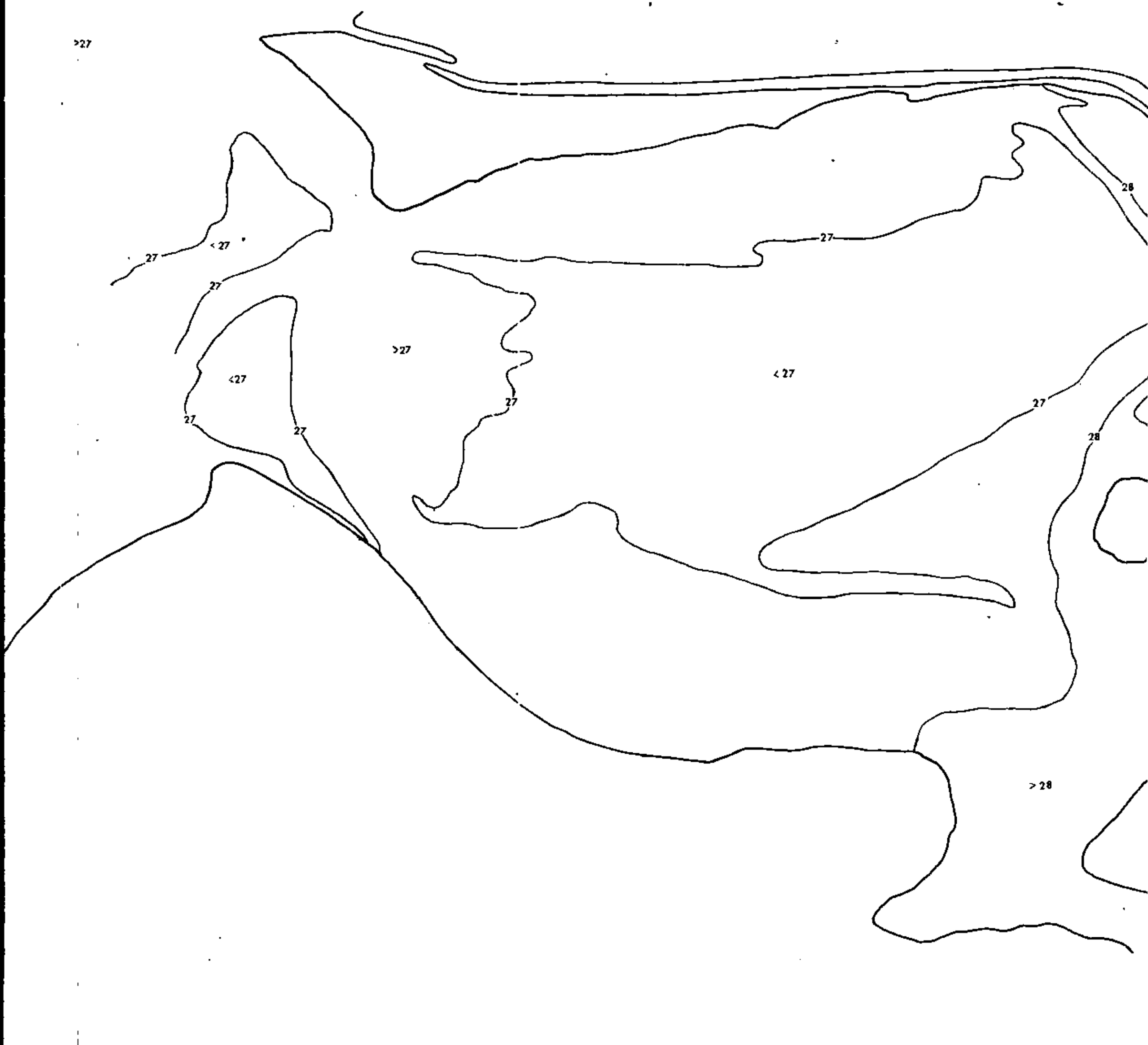


FIGURE 20

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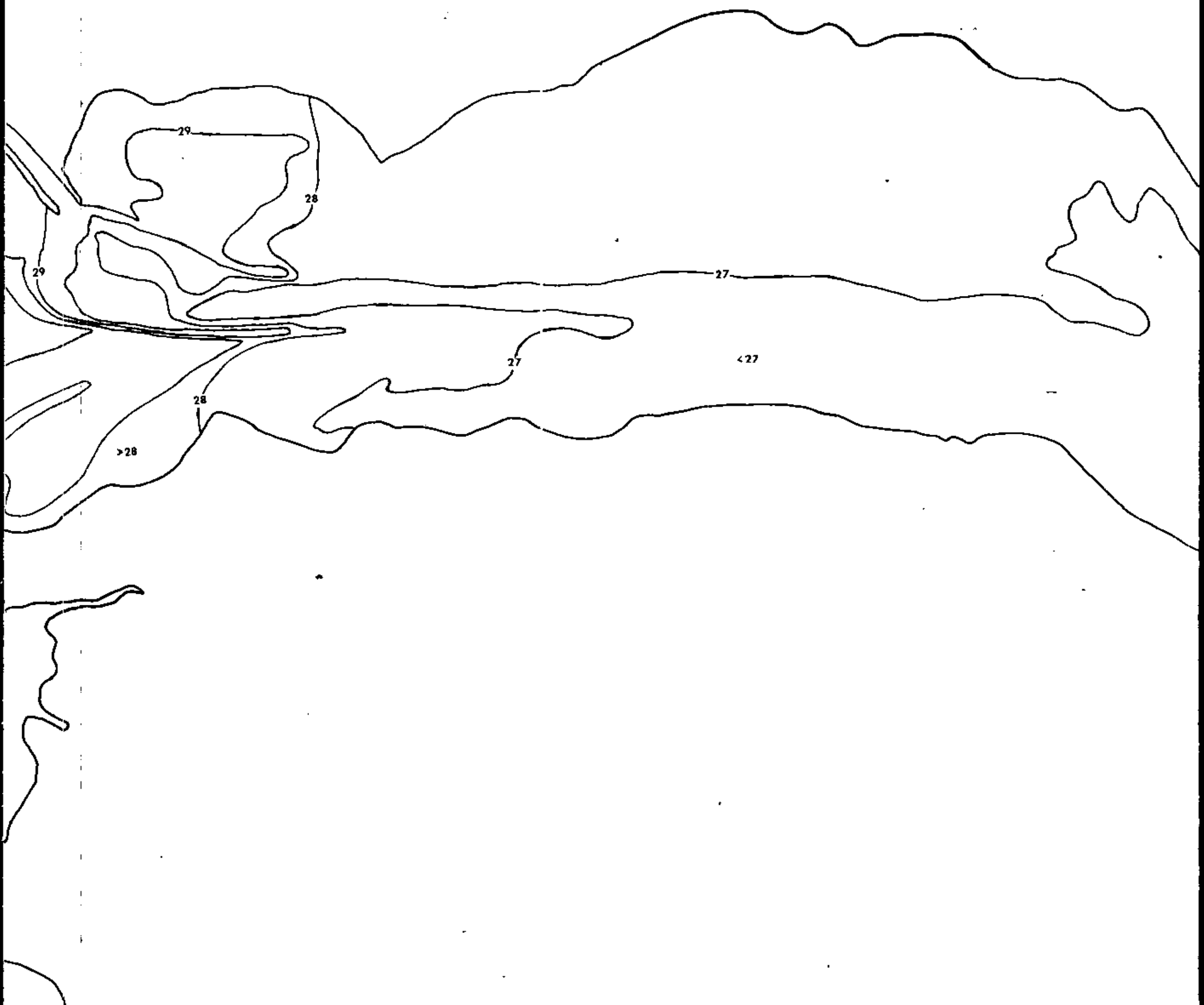
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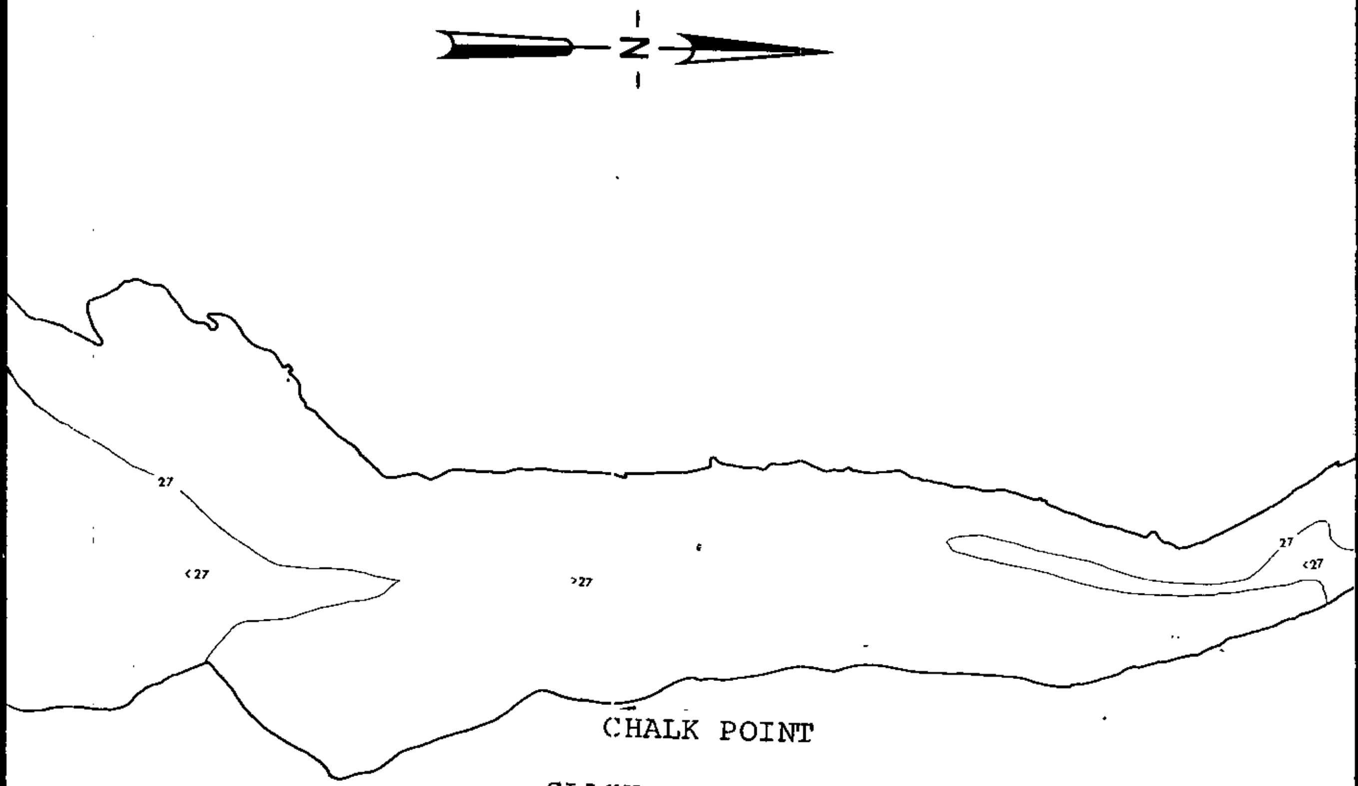
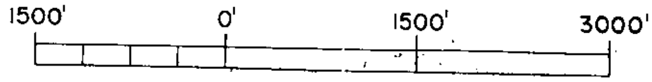
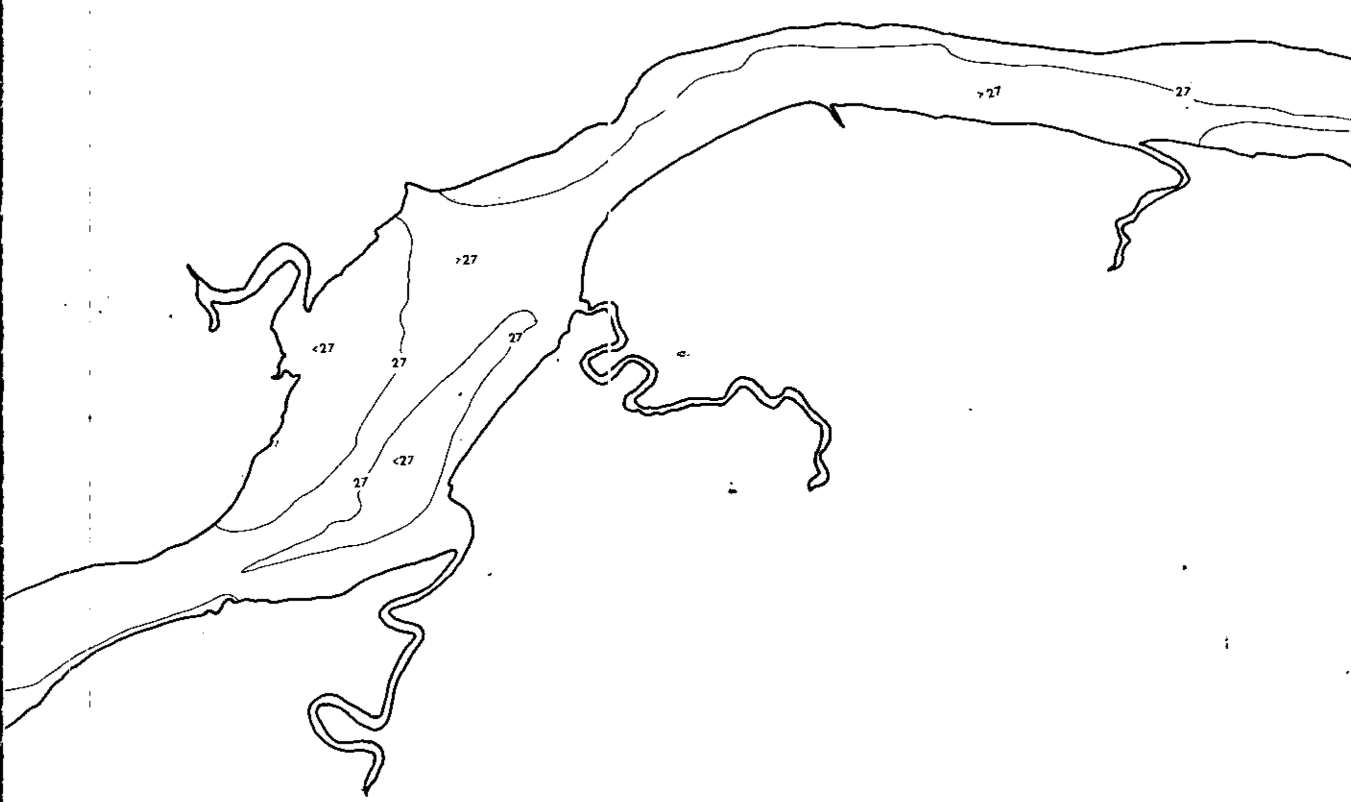


SLACK BEFORE EBB
ISOTHERMAL CONTOUR MAP
DATE: JULY 18, 1978
TIME: 1455-1535



APPROX. SCALE 1"=1500'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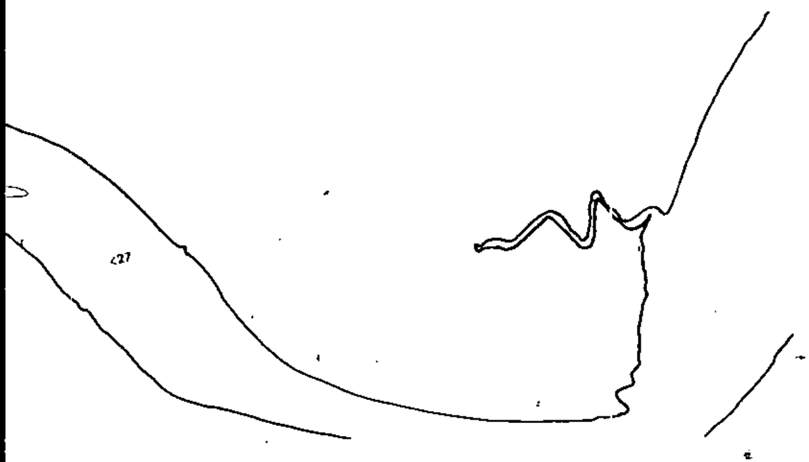


FIGURE 21

5.3 DICKERSON

For the Dickerson site, the conditions were quite normal for this site, except the discharge temperature and the apparent land surface temperature were almost identical. This obscured the shoreline somewhat, but did not otherwise affect the data.

Slightly upstream from the plant, the Potomac River appears thermally uniform with the only significant feature being cooler water of the Monocacy River discharging into the Potomac River. As shown in Figure 23, mixing of the Monocacy River discharge with the entire stream is achieved within a short distance downstream from the confluence of the two rivers. The peak temperature for the combined discharge flow leaving the Dickerson plant is 22°C, a temperature rise of 8+°C over the ambient of 13.5°C-15°C. A steep temperature gradient exists across the plume in the immediate discharge zone. The discharge from the Dickerson Plant is confined to the plant side of the river, hugging the shoreline through the first turn of the river. The influence of the high river flows on the distributional pattern of the heated discharge is clearly evident in Figures 24 and 25.

In this region, the plume continues to exhibit the same shore-hugging characteristic as it flows thru the 3.25 mile narrow channel which separates Mason Island from the east bank of the river.

TABLE #7

DICKERSON POWER PLANT

APRIL 23, 1978

TOTAL ELECTRIC GENERATION MW

TIME	UNIT #1	UNIT #2	UNIT #3	TOTAL
0900	164	118	185	467
1000	182	120	174	476
1100	187	118	185	480
1200	186	118	185	499
1300	187	126	175	488
1400	184	141	168	493
1500	185	151	142	478
1600	179	134	114	427

CONDENSER COOLING WATER FLOW

THREE UNITS

95,000 GALLONS PER MINUTE

TABLE #8

TEMPERATURES SUPPLIED BY THE DICKERSON POWER PLANT

FOR APRIL 23, 1978

	UNIT-1		UNIT-2		UNIT-3	
TIME	IN-F°	OUT-F°	IN-F°	OUT-F°	IN-F°	OUT-F°
1400	56	73	56	70	57	71
1500	56	73	56	70	56	70
1600	56	73	56	69	57	66

The smooth, almost streamline, isotherm pattern suggest a laminar flow with very little turbulence of obstruction to disturb the flow.

Some slight mixing and/or cooling seems to occur in the vicinity of the Island, where the temperature decreases to within 4°C of the ambient.

The only significant change in the behavior of the plume occurs when the warm water exits the narrow Mason Island channel, and begins to re-enter the main stream of the Potomac River. It is at this point that the plume contours have opened up slightly to allow portrayal of the individual isotherms.

The plume appears slightly larger in size and not as well defined as it travels the next 5 to 6 miles downstream.

The radiometer measurements obtained over the Dickerson site show a slight elevation of downstream ambient temperatures, a rise of about 1.5°C over the upstream ambient 13.5°C.

The temperature structures are not discernible by visual examination of the thermal mosaic. However, the temperature gradients are clearly defined in the iso-density plots after which the isotherms were achieved.

Surface temperature, ranging from a degree to a degree and a half above ambient, appears in the vicinity of the small islands along the east side of the river between Broad Run and Seneca Creek. The higher temperatures seem to be isolated to the shallow near shore area and channels surrounding the islands. No explanation of this phenomenon is offered, but perhaps a review of the physical characteristics of the stream in this area will suggest an explanation.

Thermal Runs Over The Dickerson Plant

FIGURE 22

DICKERSON ISOTHERM MAPS

Maps have been arranged in a downstream sequence

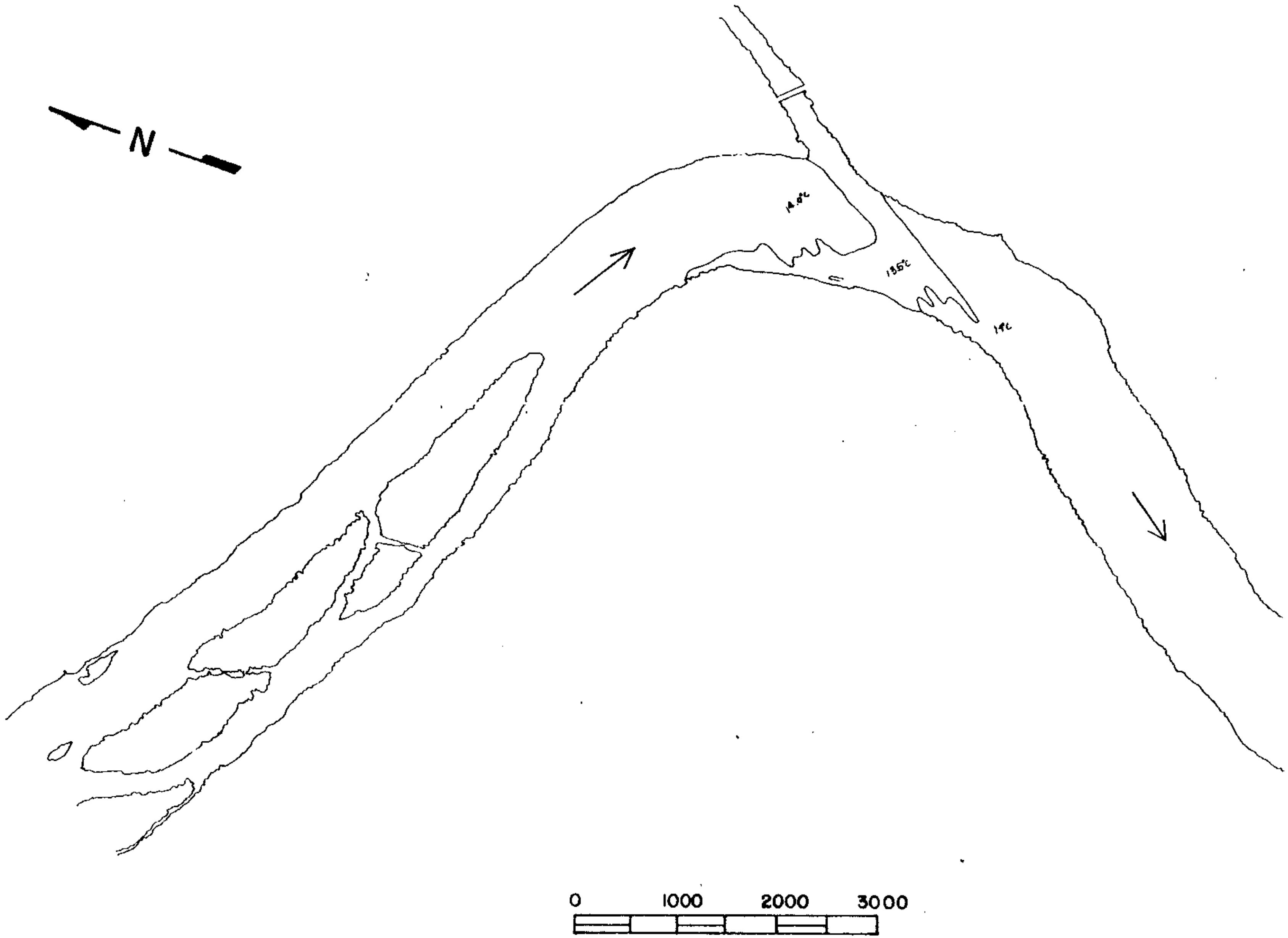


Figure 23

SECTION 1

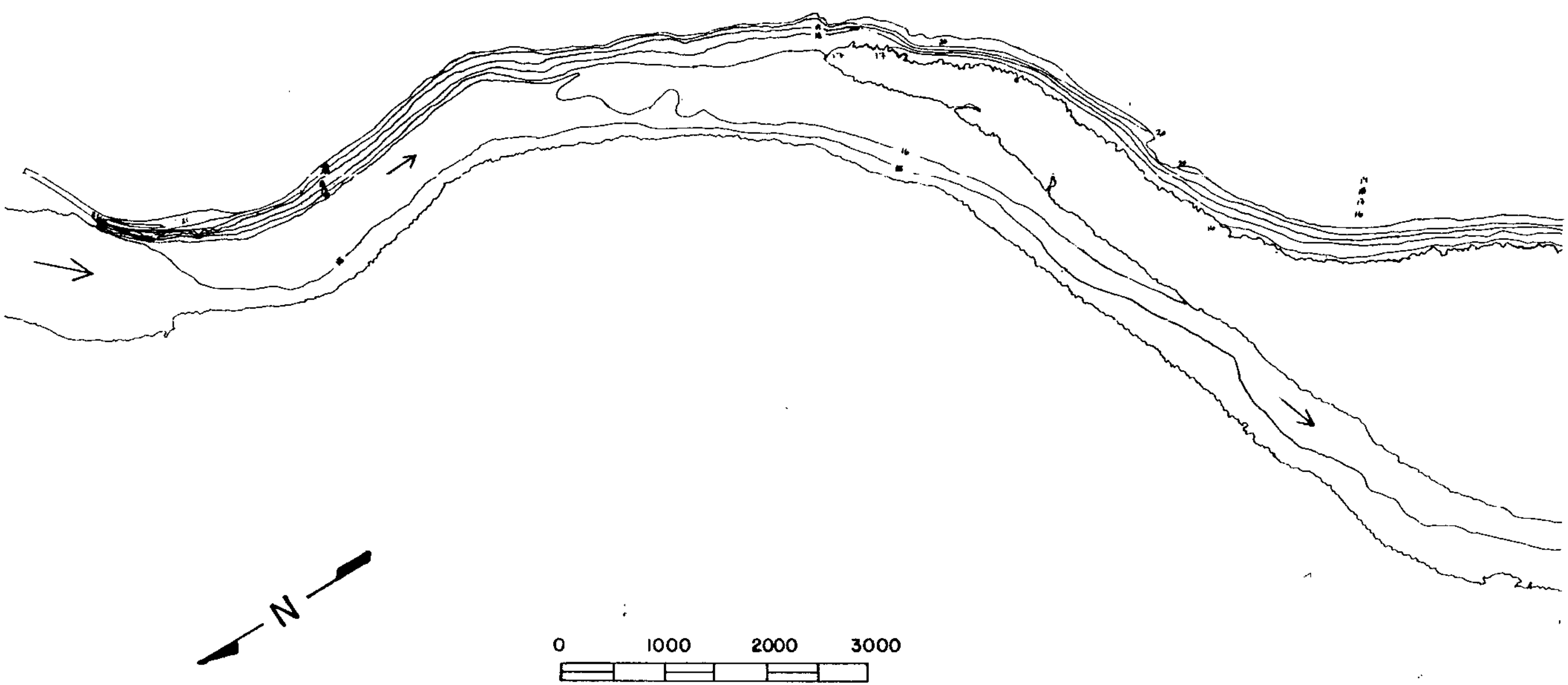


Figure 24

SECTION 2

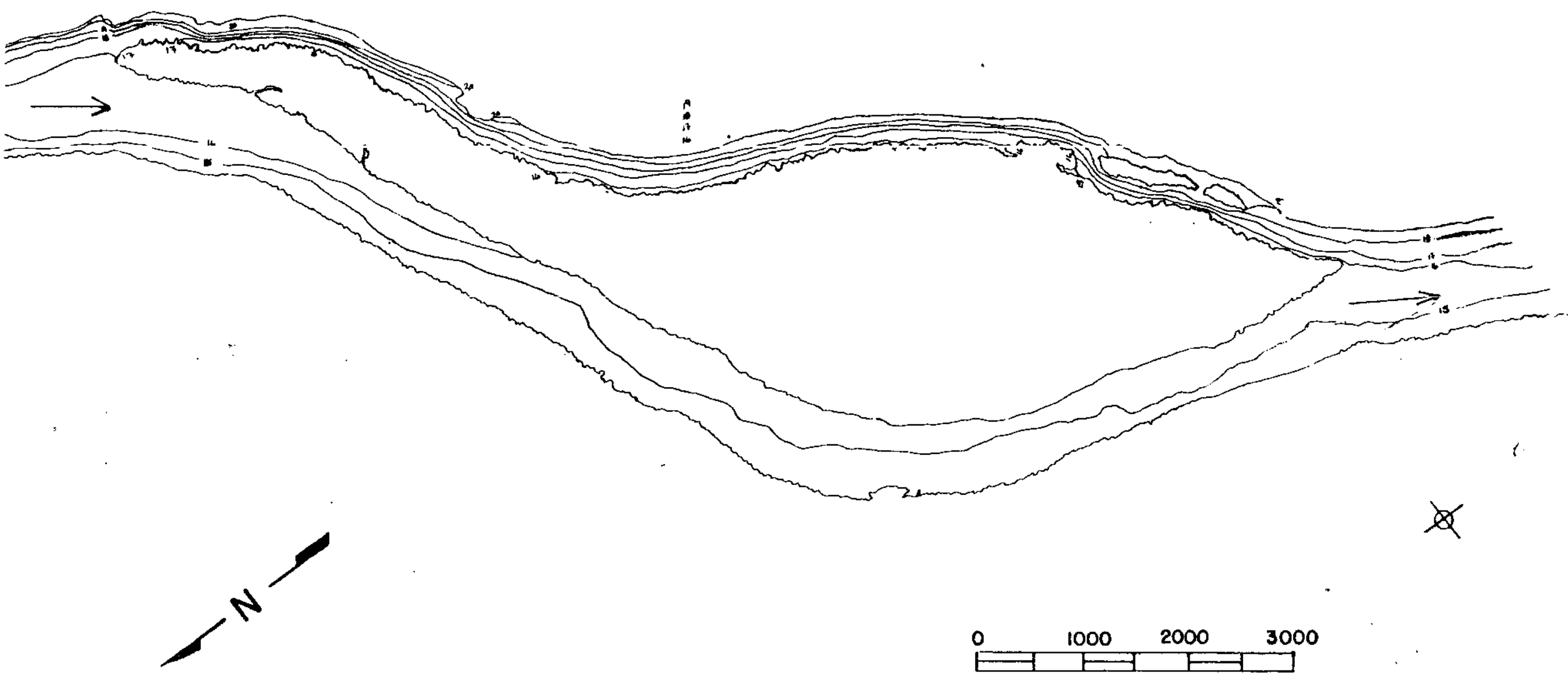


Figure 25

SECTION 3

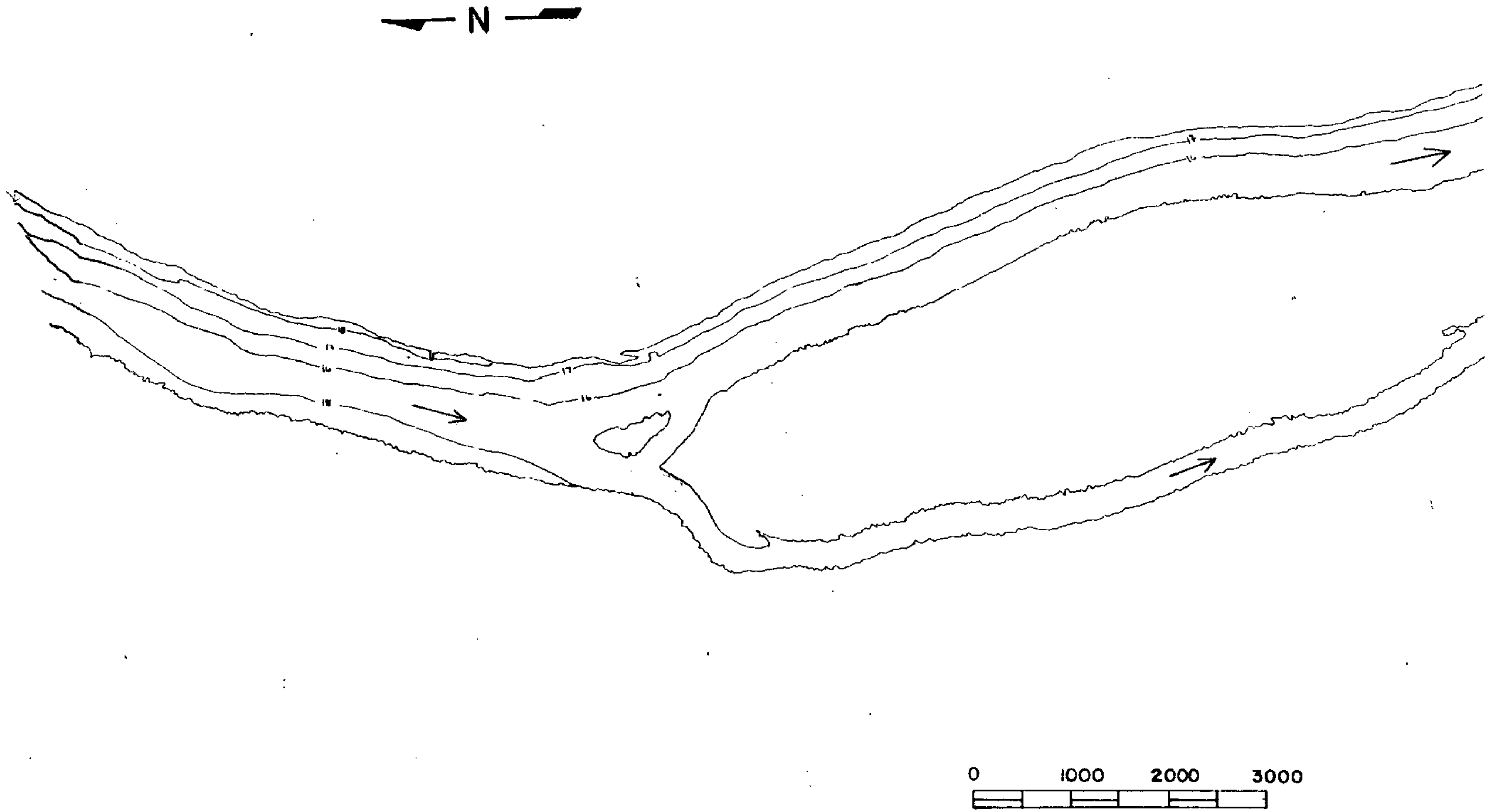


Figure 26

SECTION 4

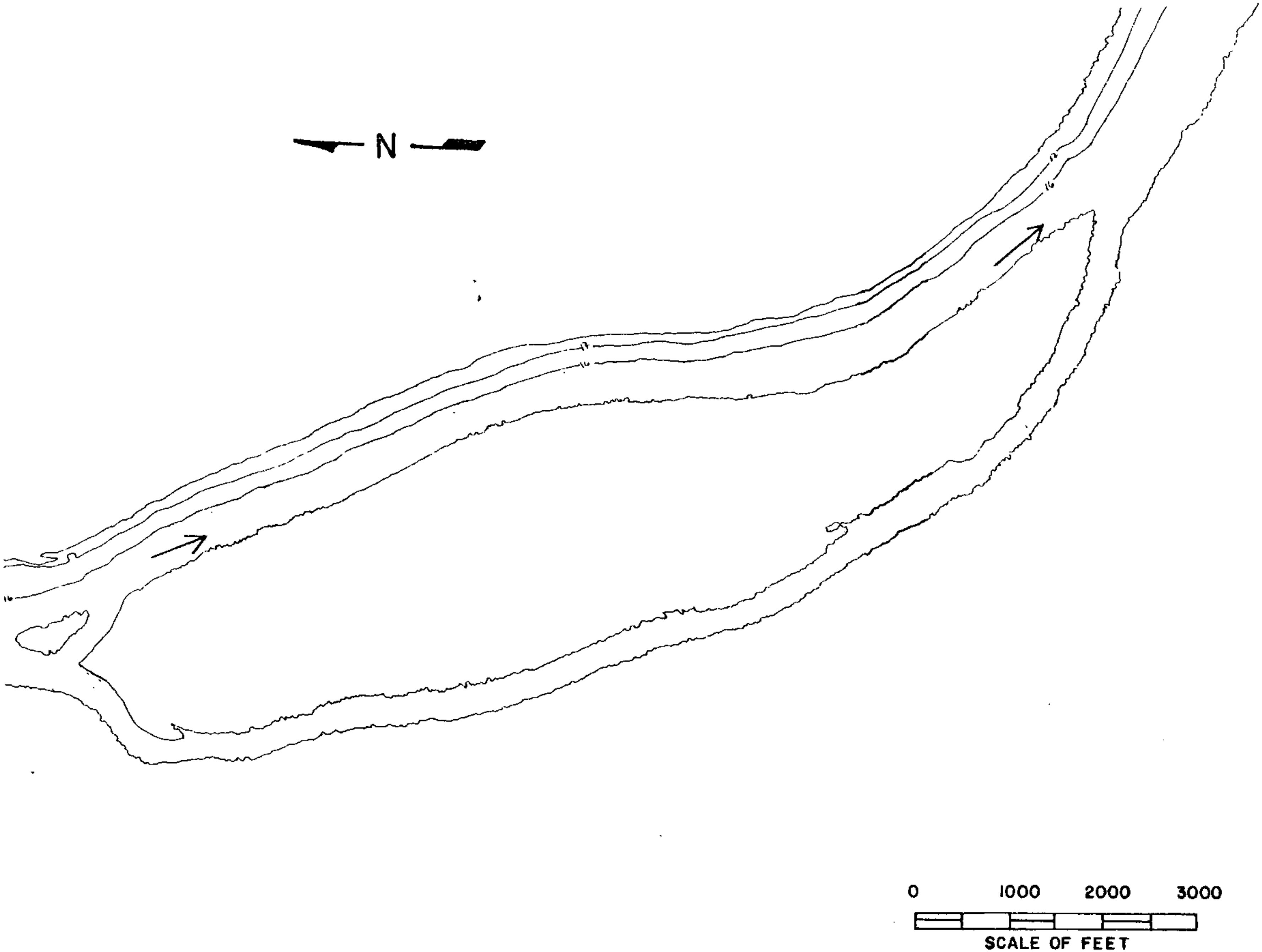


Figure 27 SECTION 5

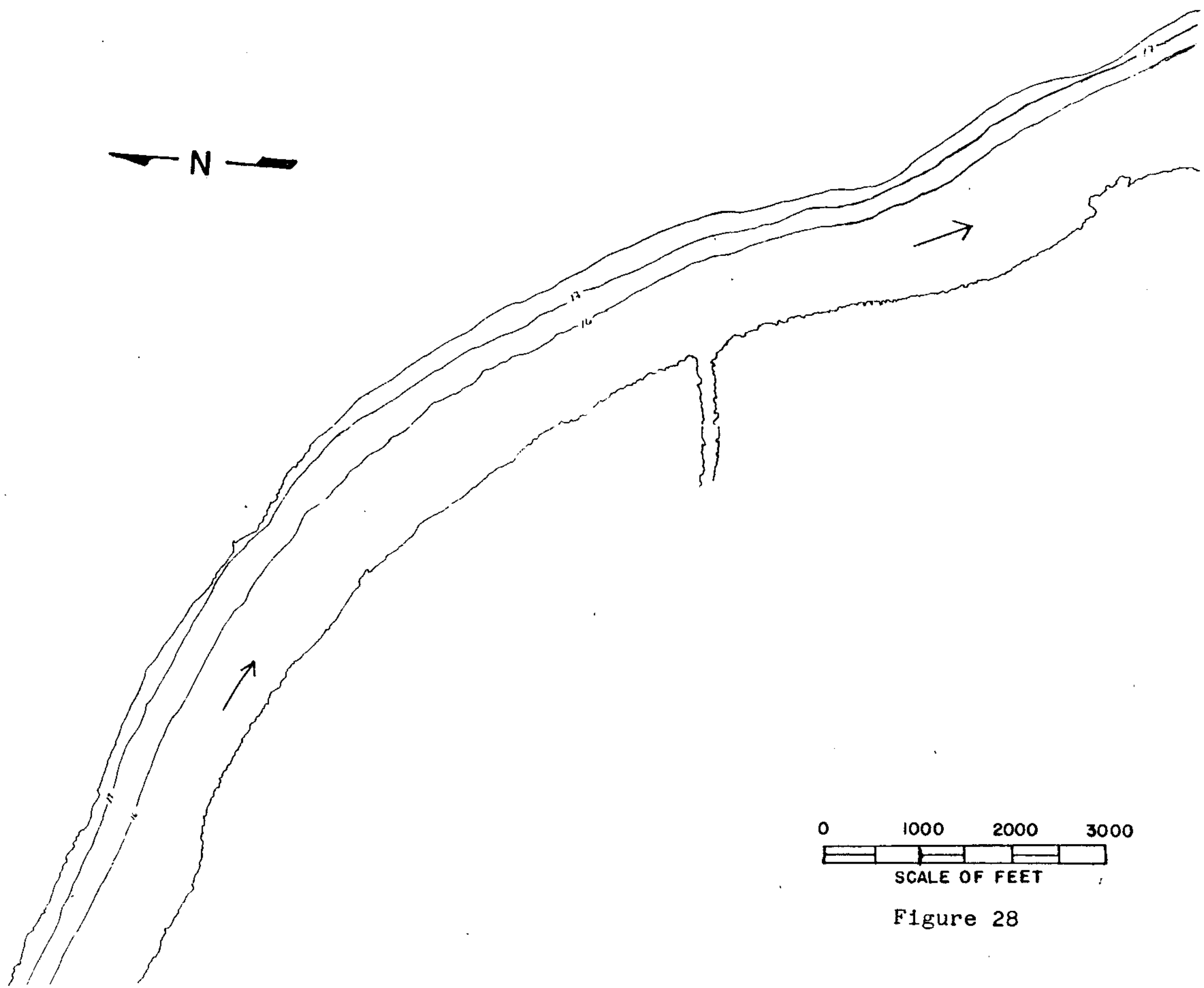


Figure 28

SECTION 6

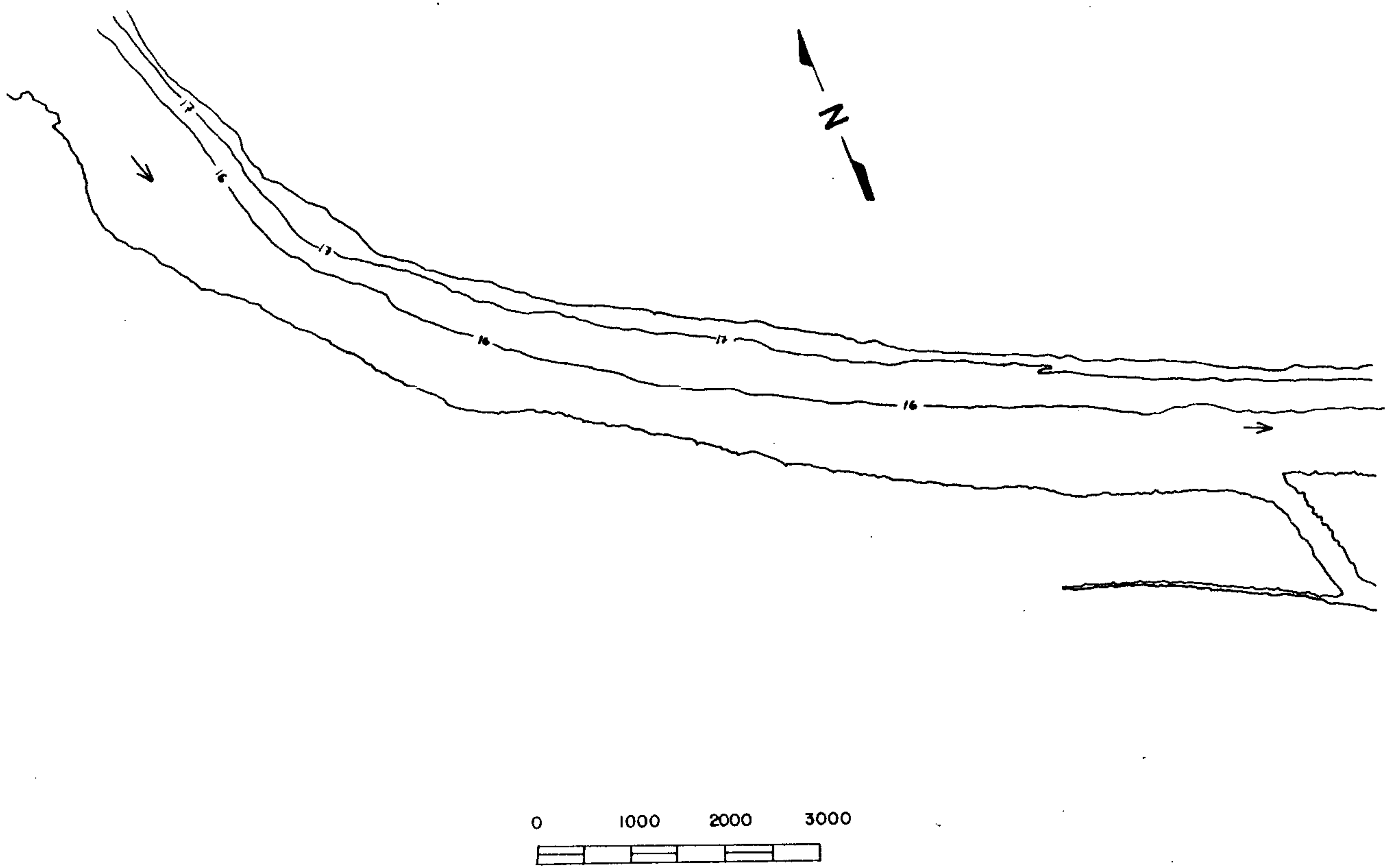


Figure 29

SECTION 7

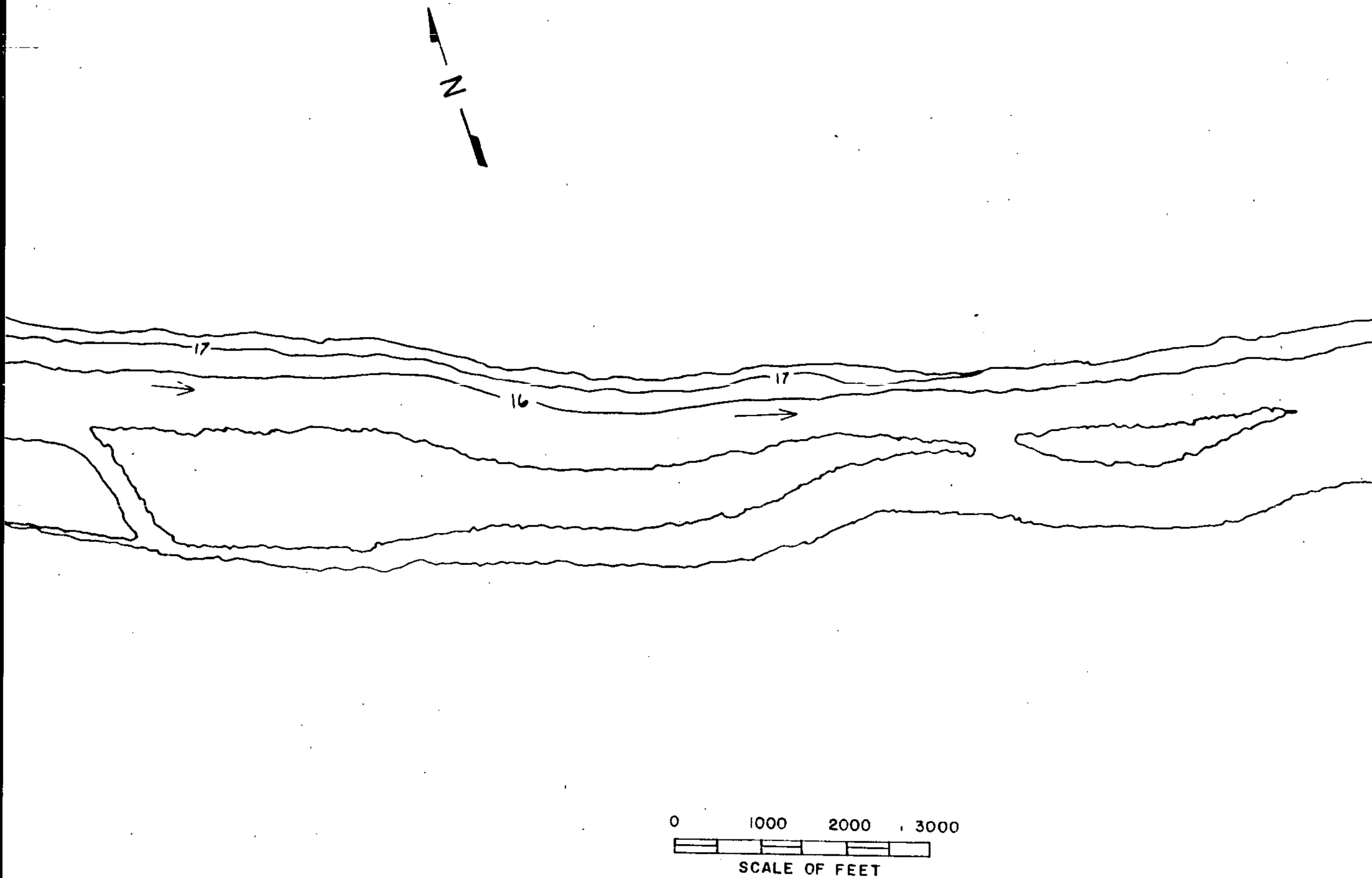


Figure 30

SECTION 8

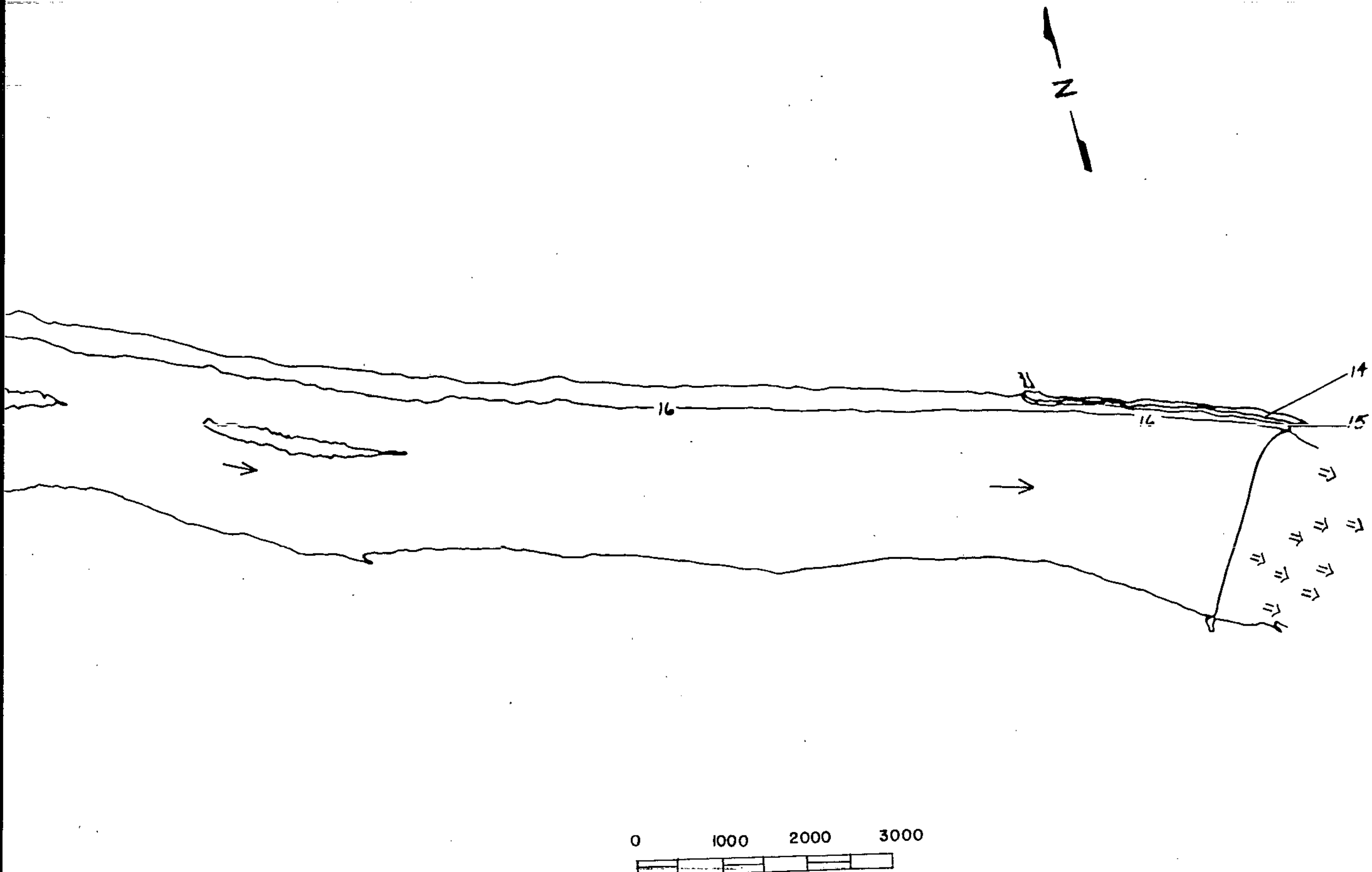


Figure 31

SECTION 9

DICKERSON THERMAL MOSAICS

FIGURE 32
THERMAL MOSAIC OF THE DICKERSON PLANT

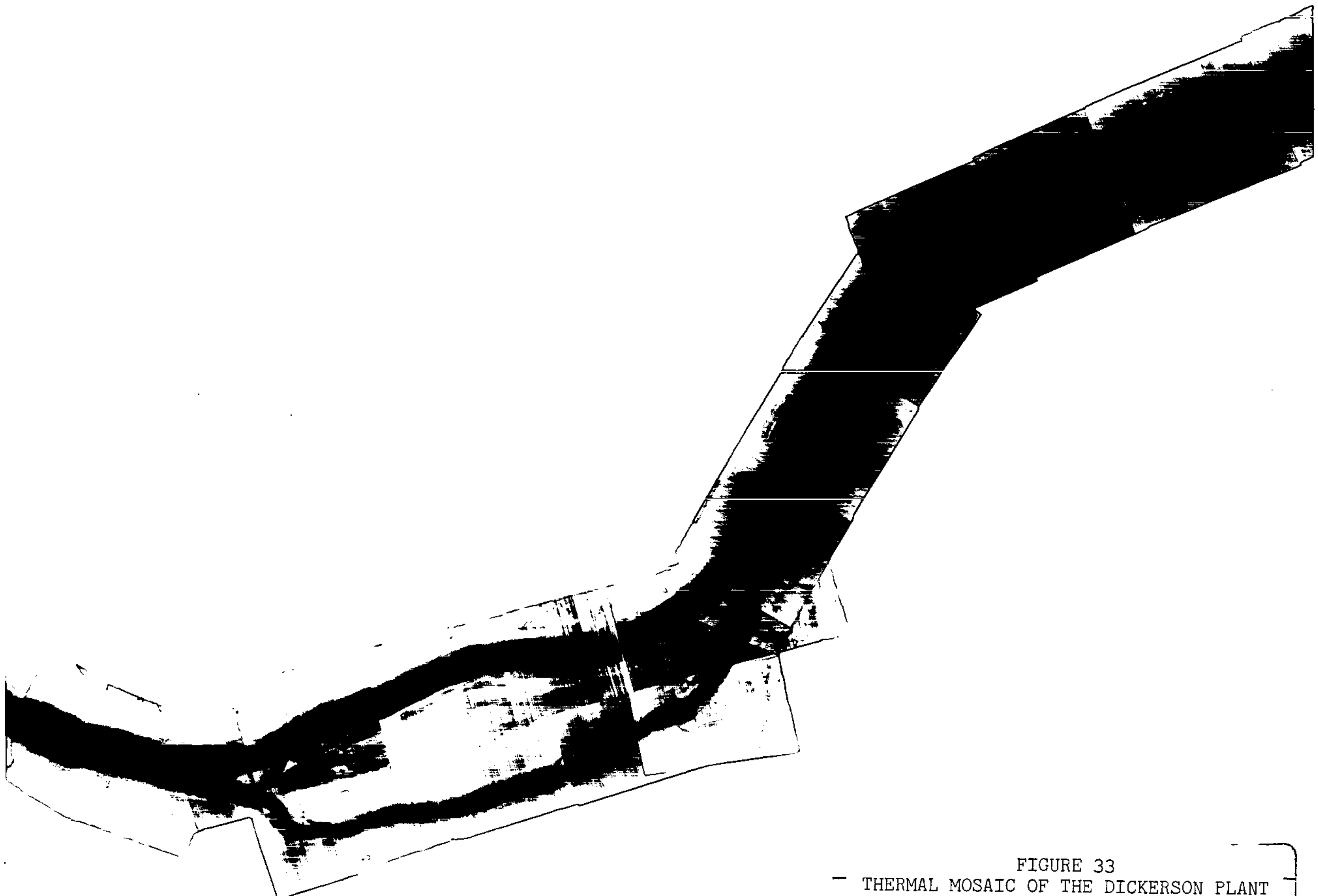


FIGURE 33
THERMAL MOSAIC OF THE DICKERSON PLANT

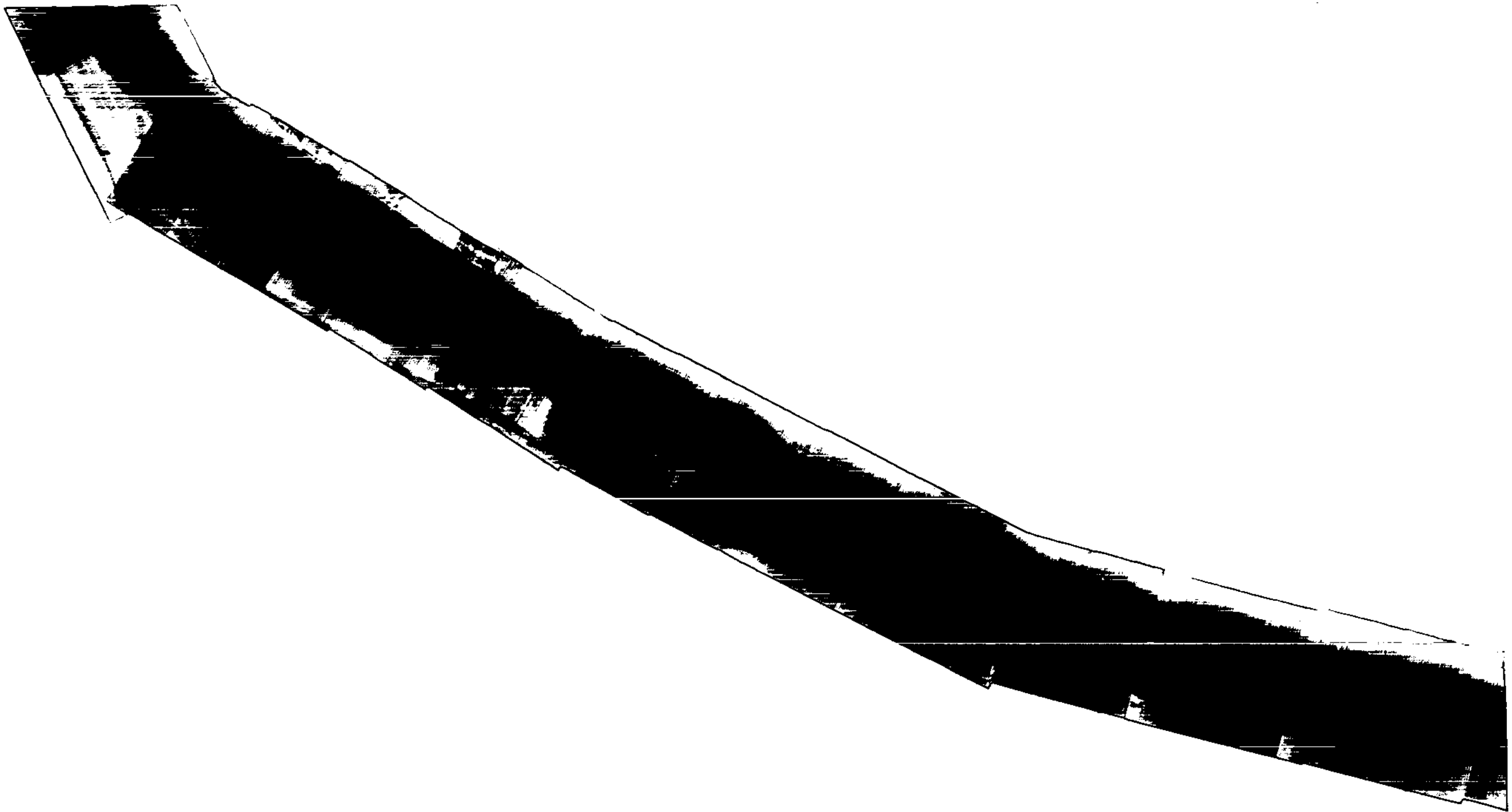


FIGURE 34
THERMAL MOSAIC OF THE DICKERSON PLANT

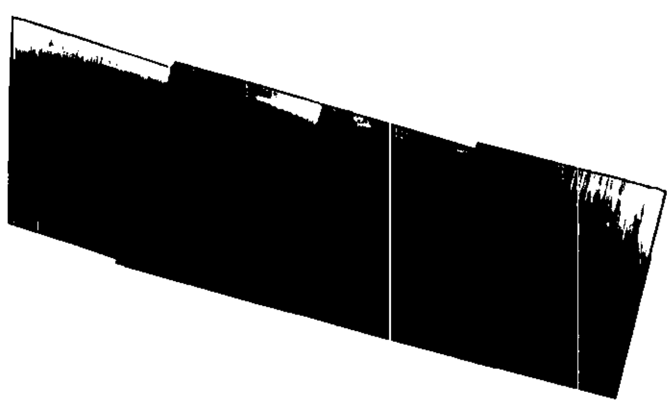


FIGURE 35
THERMAL MOSAIC OF THE DICKERSON PLANT

5.4 R. P. SMITH

At the R. P. Smith plant, the thermal survey was conducted when the Potomac River was at seasonal high flow conditions on April 23rd. The average river flow of the Potomac River on this date was 4200 cfs, recorded at the Hancock gauging station 26 miles upstream from the plant.

The flight path at the R. P. Smith site for the thermal scanning overflights is shown in Figure 36. The thermal survey mission coverage over the R. P. Smith Plant site was composed of nine flight lines, flown in a north to south direction, with each pass made following the center line of the river. The weather was clear over the site; the mission proceeded without incident and good quality data was obtained.

Ambient temperatures upstream are essentially isothermal as the Potomac River flows along a two mile section upstream from the plant from Pinesburg Station to Williamsport. Approximately 2000 feet upstream from the plant, a small tributary, Conococheague Creek, joins the Potomac River. Temperatures of Conococheague Creek are 0.5°C warmer than the Potomac River.

The R. P. Smith condenser cooling water is discharged through a multi-port diffuser located on the plant side of the river approximately 75 feet downstream from the lower level of the dam.

TABLE #9

R.P. SMITH PLANT

DATE - APRIL 23, 1978

TIME - 1100 - 1400

CONDENSER COOLING WATER FLOW

TWO-UNITS

47,700 - GALLONS PER MINUTE

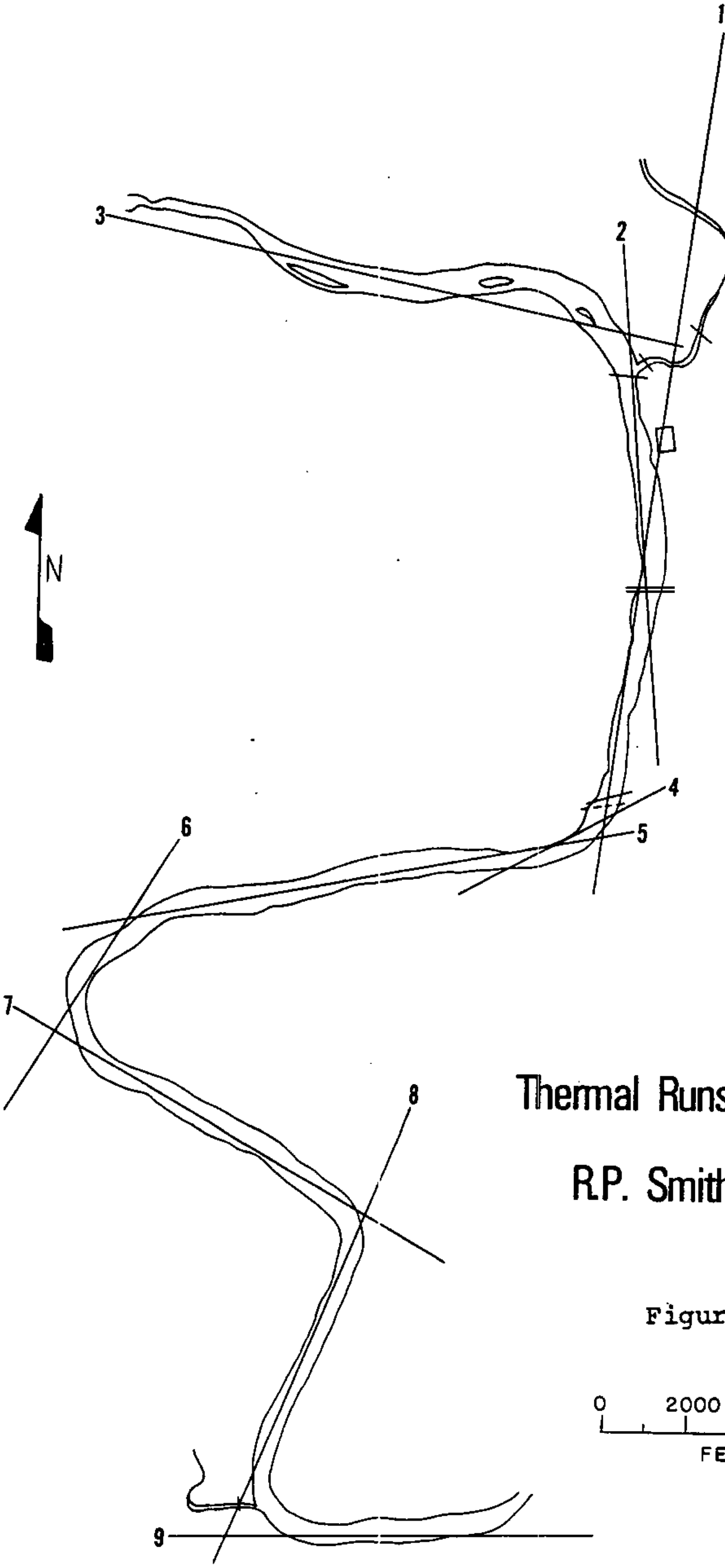
TOTAL ELECTRIC GENERATION

TWO UNITS - 89 MW

The thermal discharge reaches a maximum temperature of 22°C near shore at the discharge point, a temperature rise of 10° C over the ambient of 12°C - 12.5°C. The high river flow is quite evident as the discharge plume is held in close to shore with little horizontal dispersion.

Mixing appears to occur within a few hundred yards after the plume leaves the plant. Some further mixing occurs as the plume begins to enter the first bend in the river, about 2 miles downstream of the discharge. The isotherms are better defined at this point as the contours tend to spread out horizontally.

It is not until the flow is completely through the second bend that thorough mixing has occurred.



Thermal Runs Over The

R.P. Smith Plant

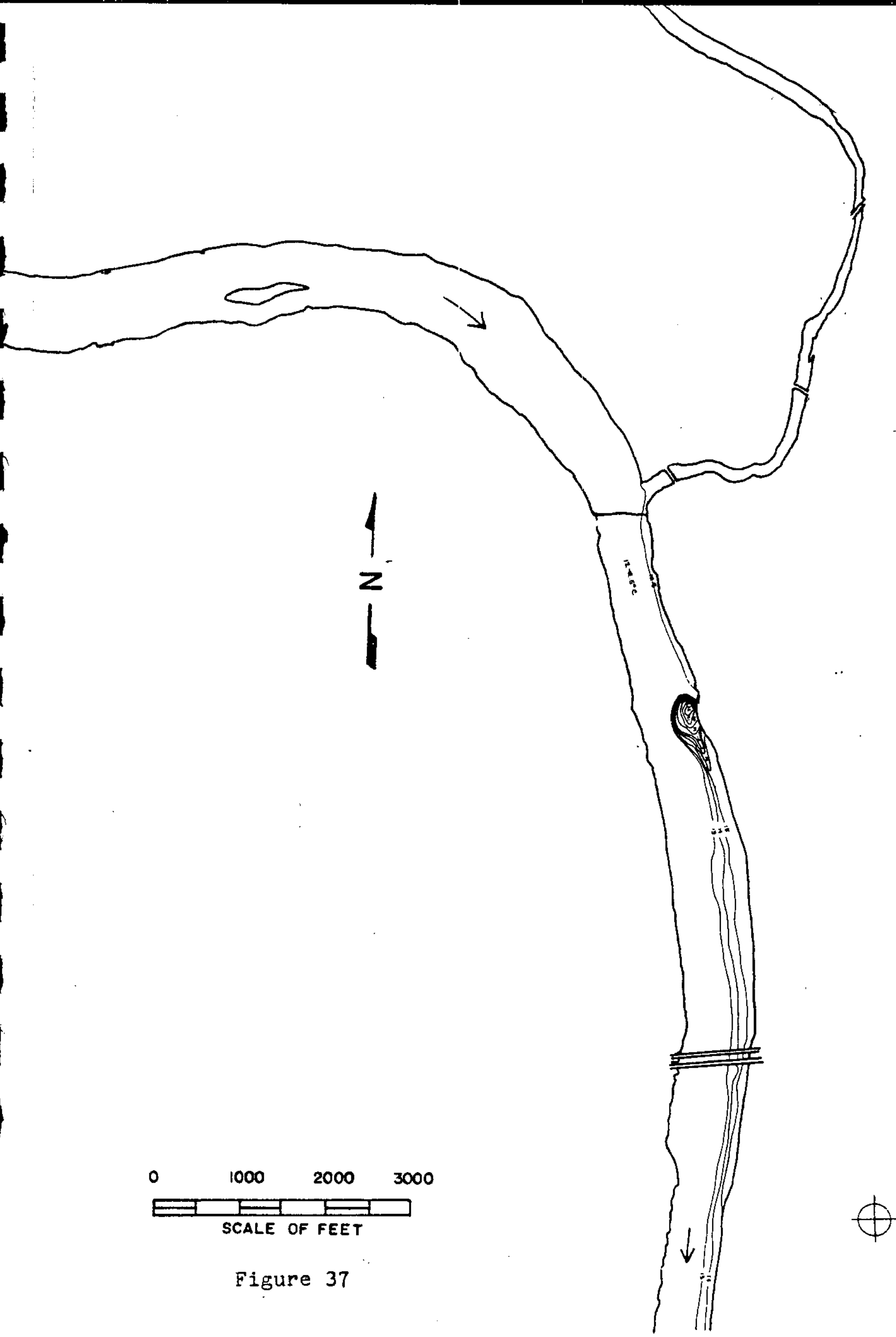
Figure 36

0 2000 4000 6000

FEET

R. P. SMITH ISOTHERM MAPS

Maps have been arranged in a downstream sequence



0 1000 2000 3000

SCALE OF FEET

Figure 37

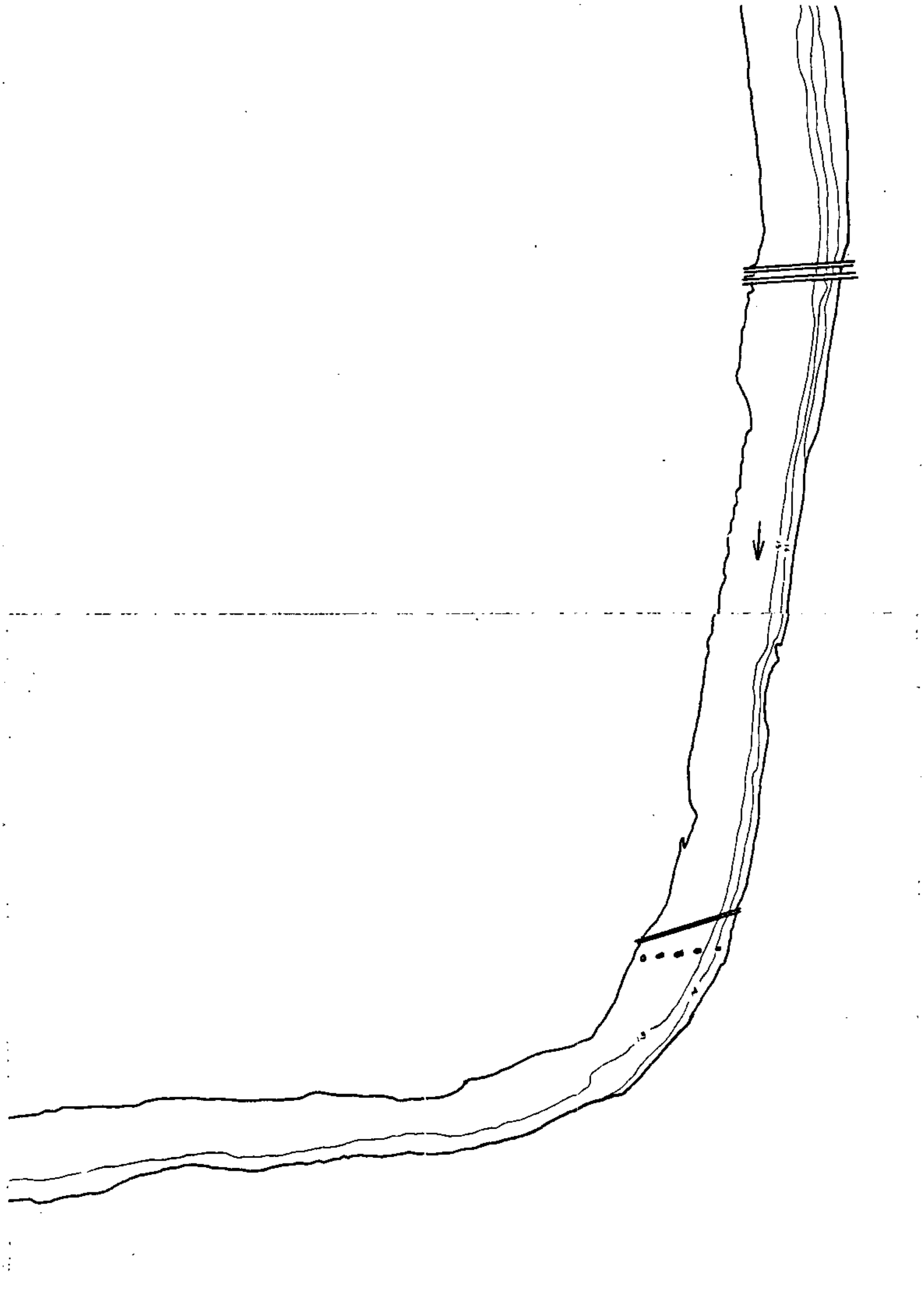


Figure 38

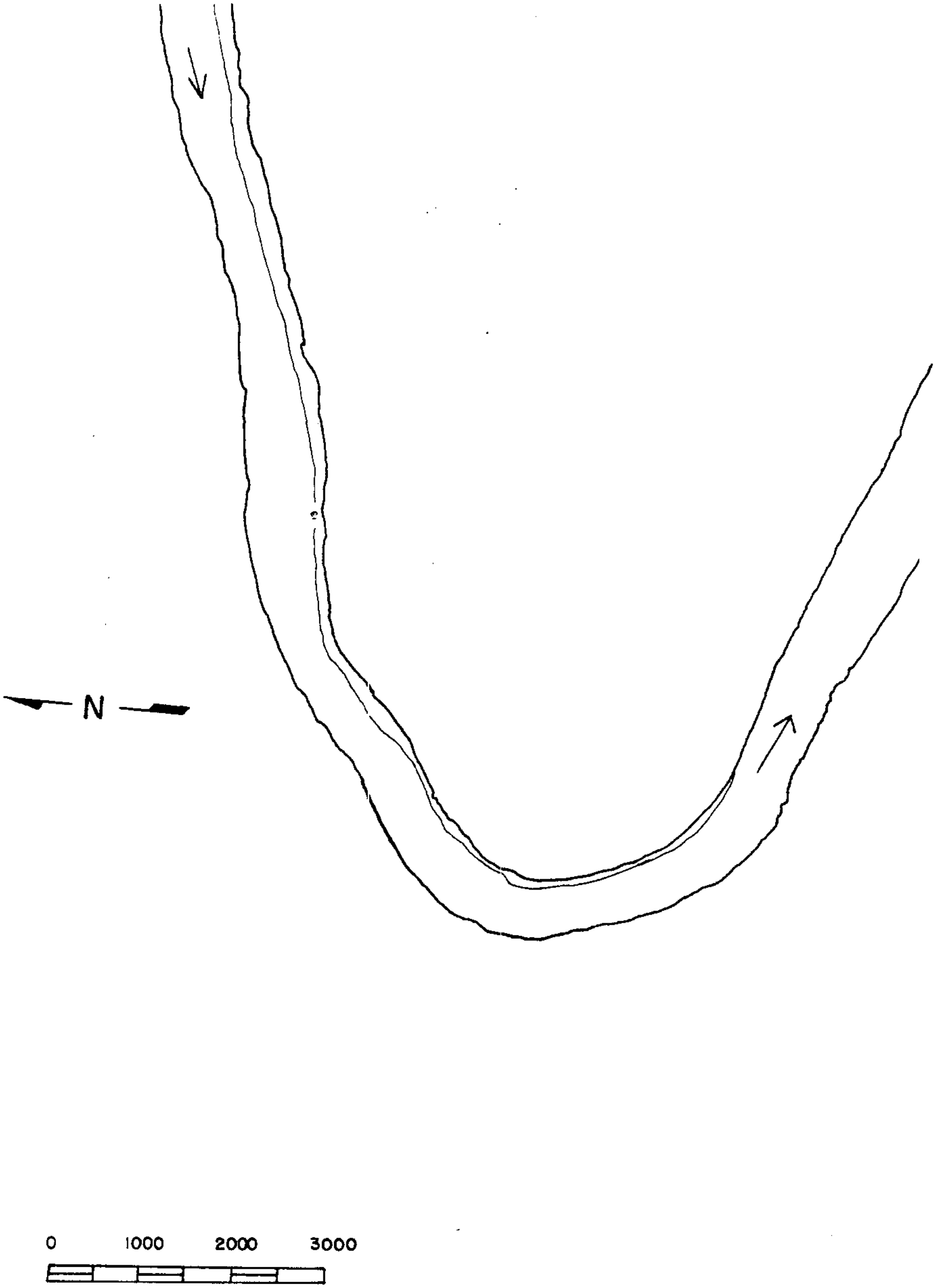


Figure 39

R. P. SMITH THERMAL MOSAICS

FIGURE 40
THERMAL MOSAIC OF THE R.P. SMITH PLANT

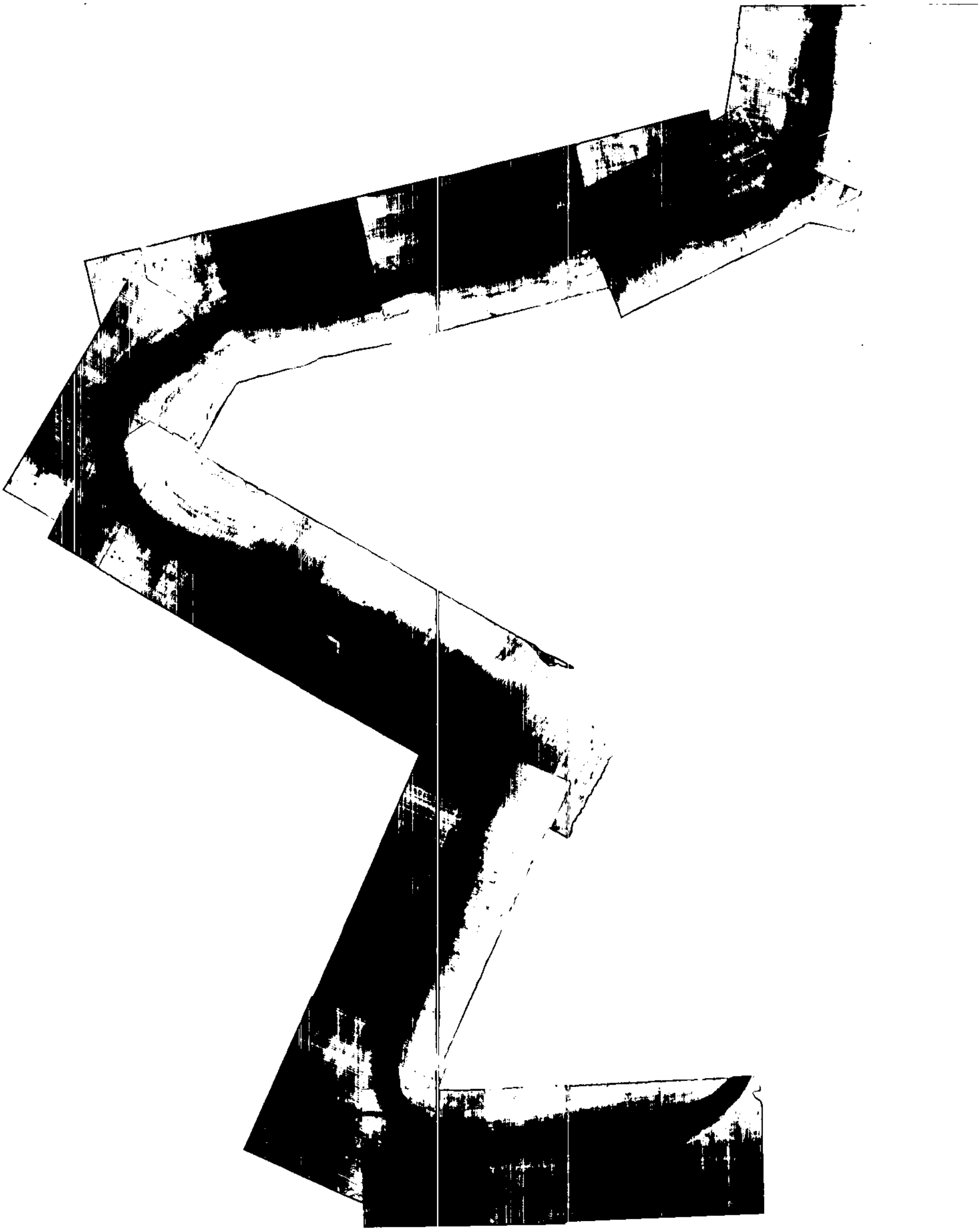


FIGURE 41
THERMAL MOSAIC OF THE R.P. SMITH PLANT

APPENDIX

EQUIPMENT SPECIFICATIONS

THERMAL MAPPER

LN-3-LW

SPECIFICATIONS

Manufacturer:	Bendix
Accuracy:	0.25°C
Sensitivity:	0.1°C NETD
Reference Temperature:	In-flight adjustable
Recorder Output:	0 to 6 volts
Electrical Bandwidth:	DC to 160 Khz (minimum)
Detector:	Mercury-cadmium-telluride
Detector Cooling:	Liquid nitrogen
Scan Optics:	First-surface 6000 rpm reflector, 3 inch aperture
Filter Band:	In-flight selectable
Total Available Bandwidth:	0.2 to 13 microns
Instantaneous Field of View:	2.5 milliradians
Lateral Scan Angle	120°
Maximum V/h Setting for Complete Ground Coverage:	0.25 radians/second or 0.15 knots/foot
Input Power:	26-30 volts, 10 amps maximum

NOTES:

This scanner is of modular design allowing the use of several different plug-in detector modules (UV, visible, short-wave IR, and long-wave IR). In addition, it is equipped with an electronic roll compensator module and a black-body reference source. While direct film recording is normally used, the output may also be recorded on magnetic tape.

PRECISION RADIATION THERMOMETER

MODEL PRT-5 SPECIAL

SPECIFICATIONS

Manufacturer:	Barnes Engineering Company
Temperature Measurement Range:	-30°C to +10°C -10°C to +40°C +20°C to +80°C
Accuracy:	0.5°C Absolute
Sensitivity (using 0.3 cps band width) at 25°C:	Better than 0.1°C
Reference Temperature:	45°C ± .5°C
Recorder Output:	0 to 5 volts linear with output temperature
Response, Recorder Output 0.3 cps: (time constant)	500 milliseconds
3.0 cps:	50 milliseconds
30.0 cps:	5 milliseconds
Ambient Temperature, Operating:	-20°C to +40°C
Detector:	Hyperimmersed thermistor bolometer
Lens:	10 mm Irtran-2, f/2.8
Filter Band:	9.5 to 11.5 microns
Field of View:	2° nominal
Input Power:	115/230 volts, 50-400 cps, 10, 20 watts maximum

NOTES:

This instrument has been adjusted to indicate equivalent black-body temperature between -30°C and +80°C in three linear ranges, and the output meter has been calibrated accordingly. Since the scales are linear, the voltage (0 to 5 volts) at the recorder output terminal is linear with temperature. The spectral passband is limited to the 9.5 to 11.5 microns interval.